THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. MARCH 5, 1896. CHICAGO, ILL. NUMBER 10.

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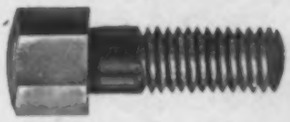

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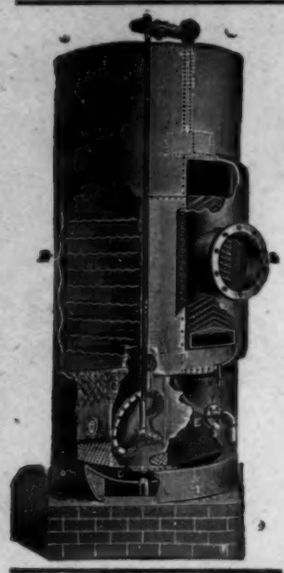

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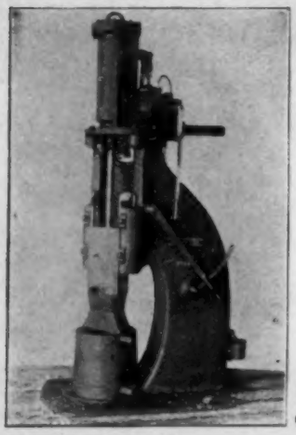

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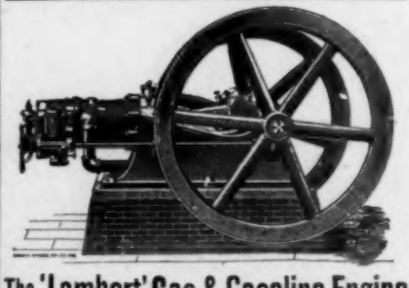

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THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. MARCH 5, 1896. CHICAGO, ILL. NUMBER 10.

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

While pig iron has had another dull week, with generally lower prices, and steel billets show no improvement, there are encouraging indications in finished material which help to balance some features in the outlook that are not satisfactory. The most hopeful facts in the situation are the railroad buying, which, particularly in rails, has been much greater than in the same period in 1894 or 1895, and the large amount of inquiry in structural lines. The leading manufacturers of building material have never had such a volume of estimating on their hands as to-day, and the engineering departments of some of these works are driven as never before. It is true that not all of this figuring will end in tonnage for the mills, but so much preliminary stir is naturally taken to mean a heavier structural business than has come in the first half of any preceding year. Other lines in which a large business has been done are cast iron and wrought iron pipe. Purchases of the former have been liberal and a number of municipal contracts are still pending East and West. In some cases the prices made have been quite as low as last year's, the lowest figures being made on Eastern contracts. In one or two Central Western lettings, cutting by smaller works has disturbed the calculations of larger bidders. Pipe works covering their wants now will get the benefit of the decline in pig iron since the large purchases of forge iron in January and early February. Recent inquiries for iron by pipe foundries and purchases by skelp mills—the latter to cover contracts in the Pittsburg district and in Eastern Pennsylvania for oil lines—have developed keen competition among Southern furnaces and have resulted in concessions by the leading Alabama interests that they have refused to make heretofore. Virginia furnaces have quoted low prices in the East on all grades of foundry iron and some sales are reported at a delivered price equivalent to about $8, Birmingham, for No. 2, which is 50 cents less than Birmingham furnaces have been quoting. Within the week the latter have changed their basis to $8.25 at furnace for No. 2. Southern forge has been coming into Pittsburg, and sales there are lower than $11, while one or two valley mills have paid $10.40 delivered. There is little change in Bessemer iron and buying continues small and scattering. A lot of iron accumulated at a Shenango valley furnace, presumably the property of a broker, sold in the week at $11.40. A sale at $11.50, valley, and another at $11.65, valley, are reported—prices which producers, paying $2 for coke, do not think of meeting. There is no change in finished material prices, in the week, except that beams and channels have been advanced $1 a ton. Plates have sold on the quoted basis, 1.35c Pittsburg for tank. Bar mills have not felt any special impetus as yet, from the placing of car orders, but early buying is looked for. Billets still drag and steel works capacity of the Central West and Ohio River districts is poorly occupied. A few sales have been made at from $17 to $17.50 at mill.

THE CLEVELAND DISTRICT.

Ordinarily a week in March would mean some progress toward the development of the iron ore and vessel situation. The week under review, however, has not been more significant in this direction than the few preceding it, with this exception: there are some signs of the preparation of price schedules on ore. Not that the basis has been absolutely decided, but the question of differentials is under discussion, and as was the case with the allotment of tonnage, the Mesabi range presents some problems that are not readily disposed of. There is a possibility that the next two weeks may see an announcement of prices, though the last week of March had arrived last year before anything was done. Much depends upon consumers. Should there be a movement on their part to open negotiations, the question of price would probably be taken up and settled. Vessel men generally are disposed to await developments in the ore market. The range of talk relative to Lake Superior charters is from $1 to $1.10, to the head of the lake.

Pig Iron. The week has been a duplicate of the preceding one so far as the volume of business in Bessemer iron is concerned. The few transactions reported are at lower prices. They seem to be confined to middlemen and to one or two furnaces whose stocks have been growing too rapidly. One sale in the Shenango valley is reported at $11.40, but the iron was not the property of the furnace company. Another sale was made at $11.65, equivalent to $12.40 Pittsburg. Steel works do not seem in a hurry to buy, as the demand for billets is exceedingly light. A better movement in wire and wire nails is expected to be felt before long at the other end of the line. On foundry irons prices have weakened and Southern competition is more marked. We quote $12.50 in the valley for No. 1 and $12 for No. 2 all-ore strong foundry iron. Southern No. 2, from Alabama furnaces, is laid down at Cleveland, however, at $12.10, under the reduced prices of Southern furnaces, and the valley quotations named above have been shaded in consequence. Southern forge iron seems to be filling much of the demand of Pittsburg and valley mills. A sale of mill iron is reported at $10.40 at valley mill. Lake Superior charcoal is weaker and quotations range from $13.50 to $14.25 Lake Erie port.

Finished Material. There is better inquiry this week, plates and structural shapes being in largest demand. The advance of $1 a ton on beams and channels, making the Cleveland price 1.45c, had the effect of eliciting a number of inquiries and a fair aggregate of busi-

Continued on page 7.

THE CHICAGO DISTRICT.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

The situation is not materially changed from last week, although sales have not aggregated quite so large a tonnage. Inquiries keep up well and it is probable that the market will be more active in the next few weeks. Additional sales of rods, aggregating about 5,000 tons, were made last week and inquiries indicate that the present week will show a further tonnage closed. The billet market has not been active as yet but it is expected to become so within a short time as the stocks of rod and wire and nail mills are decreasing rapidly and they will be in the market for more material. The local steel company reports considerably larger sales of rails. Although none were for large amounts the aggregate is exceedingly good. A better inquiry is coming from the railroads and it seems probable that this branch of the trade will grow more active. Structural material was quiet last week, no very large contracts being let, but the run of general business is improving all the time. Quotations on structural shapes have been advanced a dollar a ton.

PIG IRON.—Sales of iron last week were hardly as large as those of the week before, but the local furnaces report a good inquiry and expect to do a larger business in the present week. A number of large buyers are in the market for considerable quantities. Southern furnaces report a comparatively small business last week. The inquiries received by the Southern and local furnaces aggregate from 15,000 to 20,000 tons and it is thought the larger portion of this will be taken within the next two weeks. Quotations on local irons are steady, and few concessions are made by furnaces except on exceedingly desirable orders. Our prices on Southern irons have been reduced slightly from the quotations given last week. The prices below are as close as possible to the actual market conditions and only in exceptional cases are the Southern furnaces making reductions from these. Lake Superior charcoal sold well last week, the aggregate sales amounting to from 2,000 to 3,000 tons. Quotations are as follows:

Lake Sup Charcoal	$13 50@14 00	Southern No. 2 Soft	$11 60@11 85
Local Coke Fdy. No. 1	12 75@13 25	South'n Silveries No. 1	12 20@13 00
Local Coke Fdy. No. 2	12 25@12 75	South'n Silveries No. 2	12 15@12 75
Local Coke Fdy. No. 3	11 25@11 75	Jackson Co. Silveries	14 50@16 00
Local Scotch Fdy. No. 1	12 75@13 25	Ohio Silveries No. 1	15 00@15 50
Local Scotch Fdy. No. 2	12 25@12 75	Ohio Silveries No. 2	14 50@15 00
Local Scotch Fdy. No. 3	11 25@11 75	Ohio Strong Softeners	15 00@15 50
South'n Coke No. 1	12 50@12 85	Alabama Car Wheel	16 85@17 35
South'n Coke No. 2	11 85@12 10	Malleable Bessemer	13 75@14 00
South'n Coke No. 3	11 60@11 85	Coke Bessemer	13 75@14 00
Southern No. 1 Soft	11 85@12 10		

BARS.—The market has been rather quieter than for two or three weeks and no very large sales are reported. The mills are feeling hopeful, however, that they will be able to sell good quantities of their products within a short time. Rumors are frequent of cutting, but association mills deny that there have been any reductions made except by outside mills, of which there are few. Yet the rumors seem to have a basis of truth. Prices are made at 1 35c for common iron, 1.40c to 1.45c for guaranteed and 1.40c to 1.45c for soft steel bars from strictly billet stock.

RAILS AND TRACK SUPPLIES.—Orders last week were quite a little larger than those of the week before and it is expected that the present week will also show an increase. No large single contracts are reported but the small orders received are more numerous every week. Quotations are unchanged as follows: Rails, $29 and up; splice bars, 1.65c to 1.75c; track bolts, 2.25c to 2.45c; spikes, 1.85c to 1.90c.

BILLETS AND RODS.—About 5,000 tons of rods were sold by the local mills last week at $28. Numerous inquiries are in the hands of the mills and they will probably result in orders in the present week. No sales of billets were reported but early activity is looked for. Billets are quoted at $19.50 to $20.50.

STRUCTURAL MATERIAL.—It is expected that the Fair building, requiring from 4,000 to 5,000 tons of material, will be let some time in the present week. Numerous smaller contracts, aggregating a considerable tonnage, were let last week and others are expected to be awarded very soon. General business is continually improving and each week shows a larger scattered tonnage closed than the week previous. Prices have been advanced and are made as follows: Beams and channels, 1.70c to 1.75c; angles, 1.55c to 1.60c; plates, 1.60c to 1.65c; tees, 1.70c to 1.75c. Small lots from stock are quoted ¼c to ½c higher.

PLATES.—Good sales are reported in this class of material, and a better demand. Quotations are firm as follows: Tank steel, 1.60c to 1.65c; flange steel, 1.85c to 1.90c; fire-box steel, 2.85c to 5c; boiler tubes, 60 to 65 per cent discount.

MERCHANT STEEL.—Local dealers report a smaller business in the past week than in the week before but the demand is satisfactory and the tonnage of the present week is expected to be larger. Prices are maintained as follows: Open-hearth spring, tire and machinery steel, 1.95c to 2.05c; smooth finished machinery steel, 1.70c to 1.75c; smooth finished tire 1.65c to 1.70c; tool steel, 5 50c to 7.50c; specials, 11c and upwards; Bessemer bars, 1.55c to 1.65c.

SHEETS.—Some of the outside mills are making low prices on sheets but as these mills are becoming filled up for the near future the situation is gradually improving. The local mills report well filled order books and are not anxious for business for immediate delivery. Quotations are made at 75 and 10 to 75 and 5 per cent discount for galvanized and 2.35c to 2.40c, for No. 27 black.

OLD RAILS AND WHEELS.—No sales of old steel rails were reported last week and very little demand. A sale of 3,000 tons of old wheels is reported at $14, and other smaller sales at $14 to $14.25. A sale of 100 tons of old iron rails was made at $14, Chicago.

SCRAP.—The situation is not materially changed from last week, the market being rather quiet with not a particularly bright outlook for the immediate future. The following are buying quotations furnished by dealers: Railroad forge, $10.50 to $11; dealer's forge, $10; No. 1 mill, $6; railroad cast, gross ton, $9.50 to $10; machinery cast, $10 to $11; axles, $13; cast borings, $4; wrought turnings, $5; axle turnings, $5.75; mixed steel, $9; stove plates, $4; heavy melting steel, $10.50.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg. Bessemer and forge pig iron continue weak, and the market for steel is as lifeless as for the past three or four weeks. There is a fair volume of business in finished material, however, and prices in these lines are sustained in the main, structural material having even scored an advance of $1 a ton in the past week. It will require a strong movement in mill products to infuse much life into the market for Bessemer pig. The past week has recorded lower prices on the small amount of Bessemer iron that has changed hands. While in the preceding week there were a few transactions reported at $12.40 to $12.60 Pittsburg, the corresponding figure at valley furnace was not possible, even on iron through middlemen. But the present week has brought a sale at

$11.65, Shenango valley furnace, and another at $11.50 valley furnace. There is scarcely enough iron being bought, however, to make a market. The condition of the billet market is not encouraging. Converter capacity has not been even fairly occupied since the beginning of the year and in some cases buyers of steel have stopped deliveries on their contracts. In forge iron there has been some activity, but Southern sellers have taken most of the business. The basis is $11 Pittsburg, or $10.25 in the valley. Some sales of muck bar are reported to skelp mills, in consequence of recent wrought pipe contracts. We quote $20.50 to $21. The sales of skelp iron referred to were about 7,000 tons. Grooved steel skelp is now quoted 1.10c to 1.20c; sheared 1.25 to 1.30c; grooved iron 1.25c to 1.35c, and sheared 1.35 to 1.45c. Bar mills look for a fair tonnage in March, in view of car contracts closed and pending. The association price of 1.25c in the valley is maintained, though the few outside mills cut this from $1 to $2 a ton. Steel bars are 1.10c to 1.15c. Structural mills noted a good volume of inquiry and a great deal of work is being figured on, the outlook for building being better than that of last year at this time. There is an advance of $1 a ton on beams and channels, making 1.50c the present quotation.

Cincinnati. The past week has been a dull one in pig iron, and a majority of consumers have shown a marked lack of interest. Aside from a very limited number of orders from large buyers, nothing has transpired worthy of note. In spite of the fact that cost of Northern iron is likely to be higher during the coming season, the furnaces in that district are invading the territory usually occupied by Alabama brands and are underquoting them. This is leading to a feeling of uneasiness on the part of Southern producers, and it is likely that they will take steps to protect themselves. Prices are nominally unchanged. Some furnaces are quietly making quotations low enough to get business, but as a rule they are trying to tide over the present, hoping that during March and April a large demand will spring up sufficient to tax the capacity of all furnaces now in operation.

Buffalo. The recent contracts for freight cars taken on by local car manufacturers have resulted in some nice orders for pig iron during the past week. Outside of this, however, the market has been quiet and uneventful. Local furnaces are busy filling contracts taken some time ago, and report shipments quite heavy. Some of the local foundries that carry small stocks have been greatly inconvenienced by delays caused by the heavy snows, and have consequently ordered shipments faster than usual. In general, the pig iron market is in an unsettled condition at the present time. Northern furnaces feel they must pay the advanced prices for ore and coke, and are very firm in their views as to prices for immediate shipment, and especially so on orders for later delivery, the iron for which must be made from new stock. The Southern market is weak in spots, some of the stronger furnaces holding for full prices, but some of the weaker ones with their order books not so well filled, are accepting orders at cut prices. We quote No. 1 strong foundry, all Lake Superior ore, at $13.25@$13.50; No. 2 at $12.75 @ $13; Ohio strong softener No. 1 at $13.25 to $13.50; Southern soft No. 1 at $12.25 to $12.75; Southern soft No. 2 at $12; Lake Superior charcoal at $14 to $15.

St. Louis. A rather quiet market has prevailed the past week. Inquiries were sufficient to keep sellers interested, and numerous small orders for early shipments were placed. The demand for Lake Superior charcoal iron resulted in sales of about 1,000 tons to local consumers. Southern irons are a trifle weaker.

OBITUARY.

Charles Lewis Colby died from apoplexy Wednesday, Feb. 26, at Newton Center, Mass., after delivering an address at the 25th anniversary of the Women's Baptist Foreign Missionary Society. He was well known, East and West, as a successful business man, and especially among the Lake Superior iron ore trade through his presidency for a number of years, of the Penokee & Gogebic Development Co., and of the Wisconsin Central Railroad, which connected the "Colby group" and other Gogebic mines with the docks at Ashland.

Charles L. Colby was born in Roxbury, Mass., on May 22, 1839, and 19 years later graduated from Brown University. He went to New York in 1861 and organized the shipping firm of Dunbar & Colby. He became interested in the construction of the Wisconsin Central Railroad in 1870 and went to live in Milwaukee. While he lived in that city he was identified with the development of the Gogebic mining district. He was an active Republican and was elected a member of the Wisconsin

Legislature in 1876. Mr. Colby returned to New York to live in 1890, and since then he had been connected with a number of important business interests, chiefly mining and railroad enterprises in the West. He gave much money for educational and religious purposes, and was a fellow of Brown University, a trustee of Colby University, ex-president of the American Baptist Foreign Mission Society, president of the New York City Baptist Mission Society, a trustee of the Young Men's Christian Association in New York and a member of the Fifth Avenue Baptist Church. He was also a member of the Union League, Metropolitan, Lawyers' and University clubs, the Society of the Sons of the Revolution and the New England Society, and was an honorary member of the American Society of Civil Engineers. He leaves a widow and two sons.

WILLIAM J. MORDEN.

Wm. J. Morden, the well-known inventor of railroad specialties, died at his home in Chicago, Thursday, Feb. 27. Mr. Morden was born in Painsville, O., 65 years ago, and began life as a boy by carrying water upon a railway construction. He steadily rose in the railway service, and being of a studious nature, with a natural talent for mechanics, soon attracted attention by a number of railway devices which he perfected. From minor improvements he began to turn his attention to invention exclusively, and secured innumerable patents upon railroad crossings, frogs and lighting and signal devices. His latest achievement was an electrical locomotive which generates a portion of its own electricity as it travels and heats and lights the train it draws. The patents for this had just been secured and the contracts let for construction of one of the engines. Mr. Morden went to Chicago in 1880 and started the Morden Frog & Crossing Co. The business grew and in 1884 the present large plant at South Chicago was started.

F. K. BOWES, dealer in iron and steel, 1147 and 1148 Marquette Bldg., Chicago, has just issued a pamphlet containing standard lists of prices, sizes and weights of the various classes of bar and sheet iron and steel, and information regarding nails, rails and fastenings and Babbitt metal. The book is gotten up in neat and convenient form, and will prove valuable to buyers of these commodities.

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ENTERED AT THE POST OFFICE IN CLEVELAND, O., AS SECOND CLASS MATTER

MARCH 5, 1896.

THE SCARCITY OF SKILLED MEN.

The boom in iron, in the summer of 1895, and the revival that it brought to certain classes of foundries and machine shops, developed a condition that was generally commented upon as surprising, in view of the extreme depression from which the country was emerging. We refer to the scarcity of skilled mechanics, the complaint coming from engineering works, boiler shops and machinery manufacturers in general. The explanation was found in part in the recent changes in industry that have developed lines calling for skilled men—bicycle manufacture, electric transit and lighting, largely increased use of building steel, tin plate manufacture, etc. Another consideration, which did not have attention in this connection, is the fact that two years of depressed industry had cut off nearly a two years' supply of recruits to the ranks of trained mechanics. But the main cause given—and on this the discussion of the problem brought agreement—was the culmination of influences that have been steadily at work cu ting off the supply of all-around molders, machinists and other artisan classes. That these influences are still at work is evidenced by the following, which we take from *Machinery*:

While it is gratifying to find an increasing demand for skilled mechanics, it is disappointing to learn that considerable difficulty is being experienced in securing the men to meet the demand. We know of more than one shop where good men are at a premium and where almost anyone is hired in the hopes of getting a few skilled mechanics and draftsmen, only to find that a very small proportion are of the class wanted. It is not a question of wages nor of undesirable location, for these shops do not want cheap men, knowing that a high priced man is usually more profitable than a cheaper one.

If it be true that there is a scarcity of skilled mechanics for regular high grade machine shop work, it does not necessarily prove that the men are less intelligent or even less skilled, but it may be that their skill has been confined to one particular line; and when it comes to regular machine work, they are not able to do justice to themselves nor their employers. While this extreme subdivision of labor is necessary for the greatest economy in manufacturing, the fact that it limits the supply of desirable men for regular machine work indicates that it is not always advantageous to the employer, and is often very injurious to the men, as it limits their range of work and with it their chances of obtaining other employment.

In times when opportunities of employment are few, the workman who knows little beyond the operation of the single machine he has learned to run, finds the limitations put on him by the extreme specialization of to-day, no little hardship. He cannot turn his hand to the job that may happen to be open. Yet the inducements to young men, in the wages paid for the operation of machines, are sufficient to tempt them away from the slow-paced apprenticeship, with its small present earnings; and the possibilities of larger earnings later on, considerably greater than those of the machine operator, are ignored. Moreover, the regulations of trade unions are such that few boys can enter the door of apprenticeship. And yet another influence is the sharp competitions of the day, which lead many manufacturers to encourage specialization, because, with the help of machinery, it means a maximum of output, at a minimum piece cost. And the piece-price system is a further discourager of apprenticeships in that the skilled workmen, driving to his utmost to make the largest earnings, cannot spend time in initiating the apprentice.

We do not see that these effects of the present system, which are being felt both by employer and employed, are in the way of being remedied. The most hopeful fact in connection with them is that they bear upon both capital and labor. At all events, they constitute one phase of the industrial evolution that cannot be set down as altogether on the side of progress.

THE new Directory of the iron and steel works of the United States, issued this week, shows an enormous capacity for the production of steel in this country. From being 7,740,900 gross tons in January, 1894, our converting capacity to-day is 9,472,350 gross tons, an increase in two years of 22 per cent. But a more surprising increase has taken place in open-hearth capacity, built or building—namely from 1,740,000 gross tons to 2,430,450 tons, or 40 per cent. It would appear that no immediate necessity exists for the erection of steel works in this country. Yet the question is not so much one of total capacity, as of eligible location, modern equipment, and the other elements in cheap production. From this standpoint it cannot be said that the limit has been reached, in the Central West, at least.

COMMENTING on President Weeks's address before the American Institute of Mining Engineers, two weeks ago, arguing for the priority of Wm. Kelly's invention of the pneumatic principle in decarbonizing and desiliconizing melted cast iron, the *Bulletin* says:

"There ought not to be any difficulty in the mind of any fair man in reaching the conclusion that the pneumatic method of decarbonizing melted cast iron was experimented with by Mr. Kelly long before it dawned upon the mind of Mr. Bessemer."

With the same readiness the conclusion is reached—and Bessemer himself recognized it—that it was only through Mushet's discovery that the triple compound of iron, carbon and manganese would regulate the supply of carbon and eliminate the oxygen, that the Bessemer process came to anything more than a short-cut to the production of refined iron. But after all the testimony is in, there is no abatement of the honor that has always been accorded Sir Henry Bessemer. He shares with none the credit of inventing the mechanical appliances that have made his process cheap and effective, and that permitted of so prodigious an output of Bessemer steel that the royalties to 1879 were counted by millions.

THE ALL-KNOWING MACHINERY SALESMAN.

A concern makes a mistake by employing a salesman who "knows it all." A little of my own experience will furnish a good example: The salesman began on me three years ago urging me to buy one of his machines for a certain class of work that I had in hand. But his machine was not, in my opinion, the best kind of a machine for my peculiar work. I spent considerable time with this salesman on his first visit, showing him what I had to do, and why, in my opinion, something radically different from his machine was what was needed. Then the salesman, "as a matter of fact, and not to put too fine a point upon it," got mad; said that So & So down in Massachusetts, used his machine for the same purpose that he was trying to get me to use it for, and what was good enough for So & So, was good enough for me—and more arguments of the same class. All this, of course, made me (being only human) feel good, and pleasantly disposed towards the salesman (this is sarkazm, as Artemus Ward said.)

All this was repeated several times on subsequent visits of the salesman; and lately, not having been able to find in the market a machine that meets my ideas of what is just the thing for my special work, I have designed and made a machine which does my work in the way I think it should be done, and with which I am perfectly satisyed.

Now, I do not say I am satisfied with this machine because it is better than the machine that the salesman wanted me to use. It is quite prossible that I am satisfied with it simply because I made it to suit my own notion. There are plenty of people in the world who would be satisfied under such circumstances, and maybe I am one of them. It is also possible that this salesman's machine would really be better for my work, than the one I have made, *and this is exactly what this salesman says now every time he comes in.* But here is the point: I may not know what is the best machine for my purpose, and may not know what I want; *but* I *believe* that I know what I want, and I have conceived a violent antipathy towards this salesman, because he insists on telling me what a big mistake I made in making that machine instead of buying his. It might be said, from an ethical standpoint, that my feeling towards this salesman is wrong, and should not be indulged; all of which I admit, but the feeling remains.

Now, what is the practical result of all this? If I want a machine of any sort that this salesman handles, at any time in the future, and some other concern makes one that is, in my opinion just as good as the one that this salesman handles, which machine am I going to buy? Which one would you buy under the same circumstances? Are you so different from me, that you would be glad to see this salesman every time he comes in and practically tells you what a fool you are for not using his machinery, and give him the preference over all competitors, when you get ready to buy? And if you are like me (or for that matter, if you are not like me), don't you believe that a certain percentage of your prospective customers are like me, and have conceived a dislike for that "smart" salesman of yours, who "knows it all" and tries to air his superior knowledge of everything, including how the prospective customer ought to run his business.

I think the "smart" salesman should be taken off the road and put to snagging castings. Call me a cross-grained old bachelor, if it pleases you, but think this matter over.

SCRUTATOR.

THE tone of Welsh tin plate reports, week by week, is quite in contrast with that of mid-summer and early fall of last year. The following which we take from a Swansea market review of a fortnight ago, contains an admission that would hardly have been made six months ago:

The shipments of tin plates still remain at a low point, and, as far as can be ascertained, there is no immediate prospect of increase, as with the present cost of manufacture we are clearly unable to compete with America and other countries, who are enabled to beat us. The trade which we have already lost can only be brought back by the keenest competition in reduced value. The reports obtained to-day show that a further stoppage of works has taken place, and if the negotiations that are now pending for the reduction of wages fall through, a further cessation of work will unquestionably follow.

SEVERAL recent assignments, notably in Michigan and Tennessee, in which iron and steel manufacturers and jobbers have an unpleasant interest, have emphasized the crying need of a uniform bankruptcy enactment. The loop-holes of legislation on this subject in certain States are enough to discourage any effort by outside companies to do business in them. Recent events have shown that some of these statutes are only a cover for fraudulent preferences and convenient schemes to wipe out the old score and hand over the plant to those who contracted the unpaid liabilities.

THE CLEVELAND DISTRICT.—Continued from Page 3.

ness is pending. Bridge work furnished a 500-ton plate order, in the week, which was taken by Pittsburg. The quotation of 1.35c Pittsburg, on tank steel, has been maintained, except on some light plate business. Railroad demand keeps up and further rail-buying is looked for from Central Western roads. Bar mills find a slightly better tonnage and the association price of 1.25c prevails for the most part. The expected advance in wire nails March 1, from $2.25 to $2.40, Pittsburg, gave some impetus to February orders and local mills have been running fuller. Old material is quiet, and prices are unchanged.

Relative Conditions of Iron and Steel Plates in Use.

The *Boiler Maker* gives the statement of a prominent manufacturer of both iron and steel plates that recently there has been a larger inquiry for iron plates than for two years. To ascertain whether this accords with the experience of others that paper has propounded to boiler makers and others the following questions, the answers to which, when published, should make interesting information:

1. Does iron corrode as fast as steel?
2. Does steel last as long as iron where used in stacks?
3. Does steel show as good a condition, where used in tanks, as iron?
4. Where there is great contraction and expansion from any cause, which material gives best life and result, iron or steel

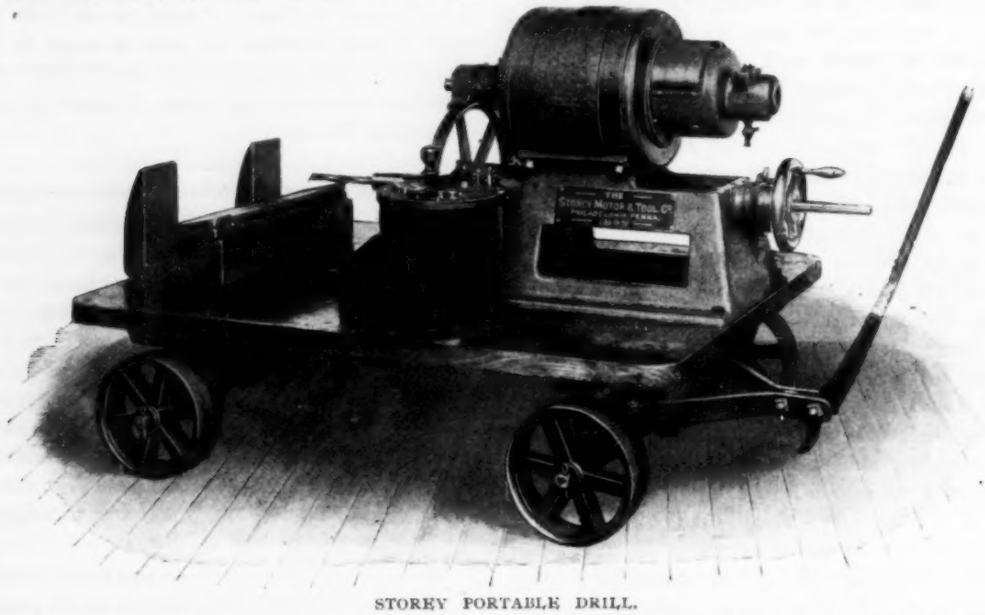
THERE has been an abundance of rumor lately concerning the Pioneer Mine and the projects, reputedly on foot, for its acquisition either by the Minnesota Iron Co. or the Lake Superior Consolidated Iron Mines. The Pioneer Iron Mining Co. has been least of all concerned about these rumors and has gone steadily forward with its preparations for getting out a good tonnage in 1896. The new hoisting plant is on the ground and will soon be in working order. There has been no intention on the part of the lessees to do anything but carry out their plans to make this mine an important factor in Vermilion range shipments for 1896.

THE foundry and hammer shop of the Midvale Steel Co.'s works, Philadelphia, were destroyed by fire March 3. The loss, amounting to $50,000, is insured.

STOREY PORTABLE DRILL.

The illustration shows one adaptation of the Storey motor, manufactured by the Storey Motor & Tool Co., of Philadelphia. Attention is directed by the makers to the fact that the problem of ventilation has not been encountered in connection with this type of motor. The prevention of heating has been studied and the necessity of ventilating, it is claimed, is therefore obviated. These motors, it is stated, have been in use by the U. S. Government for three years for driving a special machine, in a situation requiring that the motor be located inside a closed iron pedestal. Cylindrical in shape, the exterior is without flanges or bolts and the length, without the end caps, is about equal to the diameter. The end caps, in which the shaft bearings are located, extend slightly from the heads of the cylinders and the armature shaft projecting through them is coincident with the axis of the cylindrical shell. The standard base furnished with the smaller machines is pyramidal in shape, but all bases are detachable.

The motor is iron-clad, completely closed in and dust proof. There is also made a special air and water-tight motor. The bearings are self-oiling. These features, taken in connection with its form, make it possible to mount the motor in any position, with the shaft horizontal, vertical, or at any oblique angle, and adapt it to driving by direct connection a variety of machinery. The manufacturers have made a specialty of slow speed motors for direct connected work.



STOREY PORTABLE DRILL.

The machine in all sizes is four polar, two of the pole pieces projecting inward from the middle of the cylinder and shaped like a T with the cross-head parallel to the axis, while the other two project inward from the edges of the cylinder and are L-shaped, thus forming two annular spaces, one at each end of the cylinder and in which are located the field coils. The pole pieces, which project from the end of the cylinder, are formed upon rings fitted to the edges of the cylinder by ground invisible joints and held in place by bronze bolts running from one ring to the other and clamping them against the ends of the cylinder.

The cut shows a direct driven portable drill, especially adapted for drilling pig iron, pig copper, rails, etc. These drills have both automatic and hand feeds. The equipment complete consists of motor and drill combined, starting box and drum carrying 100 feet of flexible cord, either mounted on a truck or platform with or without rack for holding material to be drilled.

The applications of the Storey dynamo and motor are in connection with ventilating outfits, grinding lathes, buffing lathes, portable drills, launch motors and hoists. The works and main office of the company are at York street and Sedgley ave., Philadelphia.

Some Low-Priced Cast Iron Pipe Contracts.

There has been quite a little fluctuation in the prices made in the last two months in connection with municipal contracts for cast iron pipe—perhaps not a greater variation than has been seen in other years, but attention has been more generally called to it. There has been heavy buying of pipe thus far, and some manufacturers in that line predict that 1896 will break the record in the tonnage of contracts. Yet prices are low and in some instances those of last year have been shaded. A 2,500-ton contract let at New York in the latter part of February brought out a bid of $17.50. And the cutting has been encouraged by recent concessions on pig iron, the latest buyers on pipe works account getting the lowest prices of the year on forge iron. Contracts in Cleveland and Toledo, O., have caused not a little disturbance among pipe founders. The former city advertised for bids on 4,000 tons of pipe and the lowest bid was that of the Lake Shore Foundry, of Cleveland—$21.90. The fact that last year's Cleveland contract with this company was at $17.85 a ton caused some comment in the board of control and the council, the authorities not being satisfied with the explanation that $2 coke and a price for forge iron $2 a ton higher than the pipe company paid last year, besides higher labor, justified the difference. There were charges that an agreement had been made among the pipe companies by which the Cleveland company's bid was to be protected and after several weeks of discussion and correspondence, it was decided to throw out all bids and re-advertise.

The experience of Toledo had not a little to do with this action. The first opening of bids there showed that a Philadelphia firm's bid of $21 was lowest. It was decided to advertise again. A Detroit concern took a hand meantime, and this led to an arrangement among Southern bidders and three Northern concerns—at Columbus, Cleveland and Buffalo—to protect $18.85, any loss that might come to the successful bidder at that figure to be shared by all in the arrangement. The effort was to force the Detroit bidder to take the business at a loss. The lowest bid, as announced by the authorities, was $18.35—that of the Detroit concern—and this tended to confirm the assertion of the other bidders that the Detroit offer was one to furnish the pipe at 50 cents below the lowest bid. It is the announced intention of the companies in the arrangement referred to, to compel the filling of the contract by the Detroit concern.

THE Lookout Boiler Works, of Chattanooga, Tenn., assigned Feb. 29, making the Third National Bank a preferred creditor. Park Bros. & Co., of Pittsburg, whose claim is $3,297.56, have brought suit for a receiver, alleging irregularities in connection with the preference, also that the junior partner of the concern fled with $3,000.

THE Carterville Foundry & Machine Co., Carterville, Mo., whose shops were recently destroyed by fire, will rebuild at once. The company has placed orders with the Davis & Egan Machine Tool Co., of Cincinnati, for the new equipment of machinery.

BEAUDRY CHAMPION POWER HAMMER.

The accompanying engraving of the Beaudry power hammer shows that it has no beam, no saddle, no rubber nor spiral springs, nor straps of any sort. It is direct acting, completely under the control of the operator, and it is stated that it can be adjusted instantly, so that the full stroke can be had on a piece four inches square as readily as on a piece one-half inch in thickness. The power is obtained by a short shaft, 12 inches in bearing, having at one end a heavy slotted disk carrying an adjustable eccentric pin to which is attached the rod, which can also be adjusted, as shown, for short or long stroke; the rod slips through a spring box, which can, in turn, be instantly adjusted.

The hammer will deliver equally powerful blows on widely varying thicknesses of metal and no change is necessary except for very unusually heavy or special work. This box holds two arms provided with hardened steel rolls at their lower extremities, which run in a circular concave track and which serve to lift the ram, which is entirely independent of the machine by any other connection, thus doing away with

all jar or vibration and preventing crystallization of any of the parts. The peculiar construction of this circular concave track, combined with the action of the spring arms and rolls, imparts great elasticity to the ram. The ram is counter balanced in the pulley to raise it to its highest position when stopped. The anvil projects through the frame, but independent of it, six inches below the floor line on its own foundation. The hammer can be made to run at the will of the operator at a high speed, and to deliver a blow from one pound up to its full capacity.

The ram, spring, arms, rolls and spring box are all made of the best steel. The frame is built to secure a maximum of strength and solidity and yet occupy a small area of floor space. The ready adjustability of the machine to receive large or small work is one of its most important features. The makers are Beaudry & Co., 45 Oliver st., Boston.

AT Racine, Wis., March 3, an explosion of a gasoline tank in the engine department of the Racine Hardware Co. badly burned five men and destroyed that portion of the works.

LAKE SUPERIOR ENGINEERING.

A brief synopsis was given in a recent issue of *The Iron Trade Review*, of the paper presented before the Engineers' Club of Philadelphia, by John Birkinbine, on "Notable Engineering Achievements in the Great Lake Region." The paper has now been brought out entire, with illustrations of upper lake ore docks, the new Sault Canal and other works. We take the following extract, relating to some of the achievements that have been wrought in connection with Lake Superior mining:

The five iron ore ranges and the copper range, which have added so much to the appreciation of the territory tributary to Lake Superior, the silver exploitation on the north and south shores and on Silver Islet, the gold mining in upper Michigan, in Minnesota and Canada, and the stone quarries, all present features of interest to the engineer. The extent of these mining operations may be gauged from the fact that within forty years 100,000,000 gross tons of iron ore, and nearly the same amount of rock containing from 0.7 to 3.5 per cent of copper (for the ingot copper from this amounts to 800,000 tons), have been taken from the earth, and some of the workings have reached a depth of nearly one mile from the surface. The mining methods employed, the improved systems of timbering, in some cases the hoisting and pumping equipment, are worthy of study and imitation.

Three instances of machinery employed are offered. The elaborate equipment of the Calumet and Hecla copper mines includes a pair of quadruple expansion hoisting engines, each with steam cylinders 18 inches, 27¼ inches, 48 inches and 90 inches in diameter, giving motion to conical drums from 14 feet to 24 feet in diameter and 12 feet face, whose revolutions lift cages loaded with six tons of ore at the speed of fast railway travel, from depths 4,000 feet and more below the surface. It is worthy of remark that this machinery is of Philadelphia manufacture.

At the Tamarack mine, thirty-nine cars per hour were raised from a depth of 3,186 feet for six consecutive hours. This is equivalent to an average hoisting speed of 3,180 feet per minute, or 36.1 miles an hour, allowing a trifle over one minute for loading and unloading the cages. The load of rock was 6,720 pounds. This work was performed with a direct-acting hoisting engine, with steam cylinders 42 x 84 inches, and the hoisting drum 30 feet in diameter. At another shaft owned by the Tamarack Mining Co., a trip was made from a depth of 4,500 feet in one and one-quarter minute, equivalent to a speed of nearly 41 miles an hour. At this shaft the engine is 32 x 84 inches, and the hoisting drum, a double cone, 13½ feet and 36 feet diameter; each cone will carry 6,000 feet of rope. For short periods speeds as high as 4,200 feet per minute have been observed.

At the Chapin iron ore mine, in the Menominee range, a vertical compound pumping engine, with cylinders 50 and 100 inches in diameter, and 10 feet stroke, is designed to deliver 3,000 gallons per minute from a depth of 1,500 feet. The plunger pumps, 28 inches in diameter and 10 feet stroke, are connected to the engine through a horizontal beam, and also to a 40-foot fly-wheel, weighing 160 tons. At this mine the entire power equipment is arranged to work either with steam or with compressed air, the latter being developed by a waterfall three miles distant, and conveyed to the mine in 30-inch wrought iron pipes.

As illustrating the depths reached by some of the mining operations of Lake Superior and the relations which the mouth and bottom of various shafts bear to the level of the ocean and of Lake Superior, it may be stated that in the copper region the work has been carried to a depth of nearly one mile from the surface, and those interested in these exploitations anticipate no unsurmountable difficulties in reaching depths to 10,000 feet. The surface at these mines approximates 650 feet above Lake Superior or 1,250 feet above sea level, but the vertical shafts of the Tamarack and Calumet and Hecla, the slopes of the Quincy and other mines, extend far below the water level of Lake Superior and of the ocean, and the Silver Islet workings were carried from a few feet above the lake level to below ocean level.

The iron mines are located from 550 to 1,200 feet above lake level, and although a number have been exploited to or below lake level, but a few have been carried to depths below ocean

level. The high temperatures experienced in the Comstock lode and other deep workings in the Western States, is not apparent in the Lake Superior mines, which have penetrated the earth for great distances. The increase in temperature is not great, and at 1,500 feet the mine water becomes saline, but as greater depths are reached more objectionable characteristics are noticed, the water becoming so acrid as to destroy books and clothing and affect the skin.

The equipments for mining and handling iron ore are such that in some cases the mineral is never touched by hand until it is being shoveled into buckets in the holds of vessels at the lower lake ports; this applies especially to steam-shovel mining, and to a minor extent to "milling" operations. But even where the ore is dug by hand, appliances for transferring it from mine cars to railway cars through pockets, and from railway cars into vessels by means of expensive docks fitted with hundreds of pockets, each connected with a spout, which can be let down into the hold of the vessel, permit cheap and rapid handling, and reduce the labor cost to a minimum.

In some of the iron ore mines ore is dug from 500 to 700 feet below the surface and delivered on cars for shipment for less than 70 cents per ton. This includes wages of miners, cost of light, explosives, timbering, etc., surface and machinery attendance, repairs and all charges except royalty, general administration, and interest on investment.

Instances of economic mining are numerous, but it is questionable if any record exceeds that of the Atlantic Copper Co., mining rock which in late years has yielded but ¾ per cent of copper from depths of from 1,500 to 2,000 feet. At 10 cents per pound of ingot copper this would represent an income of $1.70 per ton of rock mined, sorted, crushed, passed through steam stamps, jigs, and over slime tables, the concentrate being shipped to a refining plant; and yet with ore as lean as the tailings from some other copper mines, this plant has paid satisfactory dividends.

During the business depression which has characterized the past two years, millions of tons of iron ore have been mined in the Lake Superior region, shipped by railroad from 15 to 90 miles to ore docks, transferred to vessels, and carried from 600 to 1,000 miles unloaded and delivered on cars at lower lake ports for from $2 to $3 per ton. Although little if any profit (after paying royalties or interest) resulted from these low prices, the possibility of accomplishing the above result is a tribute to the skill in mining, transporting and handling large quantities of ore.

The shipment of mineral from the Lake Superior district has encouraged the construction of nearly if not quite 1,000 miles of railroad, a score of shipping docks, and numerous vessels of improved design. The iron ore shipping docks alone have required an outlay of about $5,000,000, the cost averaging about $1,000 per pocket or from $8 to $10 per gross ton capacity. Some of the docks demanded 10,000,000 feet B. M. of lumber in their construction.

Large investments in the receiving docks of lower lake ports supplement the shipping docks and permit of low cost and quick dispatch, as is well exhibited by the new steamer "Victory," the largest of the lake marine, which was loaded with iron ore at Two Harbors in five hours, and discharged a cargo of 3,650 tons into railroad cars at Ashtabula in six hours 30 minutes, working 11 hatches simultaneously. At the same port this vessel was loaded with 4,000 tons of coal, by the car-dumping machine, in 10 hours, 15 hours being required at the head of the lakes to remove the cargo. A vessel of modern construction can go from Lake Erie ports to the head of Lake Superior light, receive a cargo, return and discharge its load in seven days; but if loaded with coal going west, the average round trip, including two loadings and two discharges, occupies nine to 10 days.

IN acknowledging the resolutions recently passed by the Youngstown, O., Board of Commerce, in electing him an honorary member, Andrew Carnegie says of such bodies: "In the chambers of commerce of our cities, which are so generally being organized and which are rapidly attaining power, I see the combination of the most intelligent men of all parties into compact societies, entirely devoted to the attainment of what is really best for our country. And to these I look for such irresistible action in emergencies as will always keep the ship of state upon the true course, by sacrificing party for patriotism."

LAKE SUPERIOR IRON MINES.

Development work has been going on steadily at the Atlantic mine at Iron Belt, Mich. It is expected that another working shaft will soon be put down, and that the shipments for 1896 will be of good volume.

A 30,000 yard stripping contract has been let by the Antoine Ore Co. whose property is near Iron Mountain. The depth to be removed ranges from two to 30 feet. The company has in sight not far from 1,000,000 tons of high-silica ore.

The Minnesota Iron Co. has purchased at $400,000 the fee of the Moose mine east of Virginia, Minn. There are 80 acres, constituting the east ½ of the southeast ¼ of section 8, 58-17, just east of the Shaw property. The other option, which the Minnesota Iron Co. had on the Moose was for a lease, with a minimum output of 112,000 tons at 18c. royalty.

Arrangements are being made for a resumption of operations at the Commodore mine on the Mesabi range.

The Chicago, Milwaukee & St. Paul Road will build an extension from Champion, Mich., to Ishpeming, getting an outlet to the Marquette docks through the new Lake Superior & Ishpeming Road. This will give a new outlet to an additional tonnage of Marquette range ore.

The Lake Superior Consolidated Iron Mines has taken an option on the Humphrey property, 40 acres, adjoining the Alpena and Sauntry, northwest of the town of Virginia, Minn. A considerable depth of ore has already been proven in the exploration now going on.

The Lake Superior Consolidated Iron Mines has acquired four forties near Hibbing, Minn., from the Pillsbury family, of Minneapolis.

The Newport mine on the Gogebic is now employing 260 men and its stockpile contains 85,000 tons. At the Palms 225 men are at work. The Wakefield district now employs 400 men.

For the No. 3 shaft at the Aragon mine, Norway, Mich., on which work is being pushed, the Webster, Camp & Lane Machine Co., Akron, O., will furnish a complete hoisting plant.

The Minnesota Iron Co.'s expenditures in new properties and equipment since April 30, 1893, when the last dividend was paid, have reached a large total, and further heavy outlays are to be made in these directions. Yet it is the expectation that the payment of dividends will be resumed in the near future, at 1½ per cent a quarter.

The management of the Jackson mine, Negaunee, Mich., after thoroughly testing the deposit, has decided that it has not a workable body of ore in the find recently made by workmen in the Lake Superior & Ishpeming railroad cut on the Jackson property. Railroad work, which was suspended under the expectation that a new route would have to be found for the railroad, has been resumed.

The Dexter mine, Marquette range, is figuring on a new hoisting plant and new air compressors. The shaft is now down 445 feet and will be put down 50 feet farther. It is expected that last year's output will be considerably increased.

The exploration by the management of the Cleveland mine at its new property on the south side of the old Lake Angeline basin, has developed a deposit of excellent ore, but its extent is not yet determined.

A STATEMENT contained in the synopsis given last week of Mr. A. E. Outerbridge's paper on "Mobility of Molecules of Iron" read at Pittsburg, before the American Institute of Mining Engineers, calls for qualification. Mr. Outerbridge's experiments, which were entirely with cast iron, showed that six bars subjected to 3,000 taps with a hammer on one end of each bar gained in strength as compared with companion bars not hammered or put through the tumbling barrel. The word "not" was omitted in the synopsis, in this connection. In the impact tests referred to, six bars were taken and the drop gauged so that a single blow broke them. Then six companion bars were taken and subjected to a drop of the weight for half the distance, from 10 to 50 times, upon each bar. The strength of the bars so treated was greatly increased, and it required a number of drops of the weight, the full distance, to break them. It was found that a single drop of the weight the half distance was not sufficient to relieve the strain of the molecules of the casting.

PECULIAR CASE OF CORROSION.

In a recent issue we gave a cut illustrating the corrosion to which brass pipes are liable when used *inside* of a boiler for conveying the feed-water from the shell to the place of discharge. We have no objection to the use of brass feed pipes, *outside* of the boiler, provided they are not exposed to high temperatures; but we have repeatedly had trouble with them when they are used internally. In the case illustrated in the previous issue, it was the brass feed itself that corroded, and this is the usual form the trouble takes when brass pipes are used; but it sometimes happens that the corrosion appears in some other part of the boiler—usually close to the brass

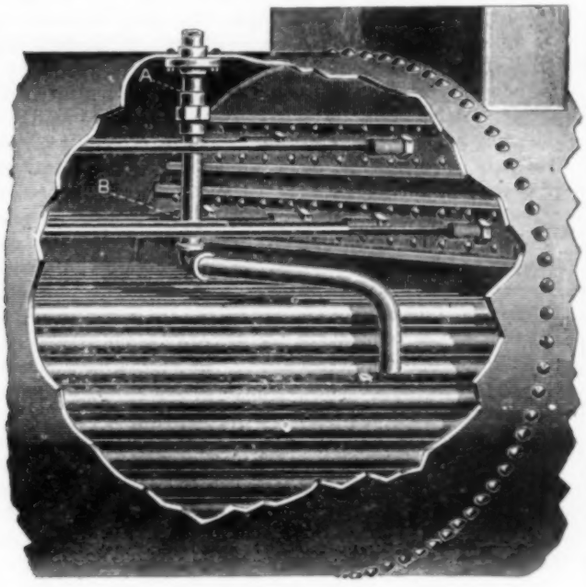
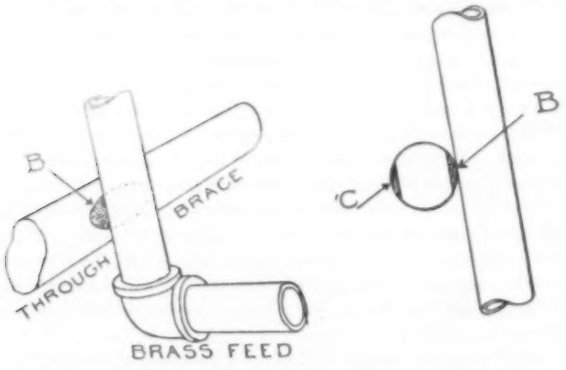


FIG. 1.—SHOWING THE COURSE OF FEED PIPE.

pipe—and it is a case of this kind that we have selected for illustration in the present issue.

Fig. 1 shows the general course of the pipe under consideration. It entered near the top of the shell, toward the front end of the boiler, passed downward until just below the water line and then turned to the right and discharged downward along the side of the shell. There was a union just inside the boiler as shown in the illustration, and at the point marked *B* in Fig. 1 the pipe passed very near one of the long through braces that are shown. The reaction of the water, as it escaped from the curved end of the feed-pipe, probably caused the pipe to frequently come into actual contact with the brace in question, at the point *B*. In fact, the pipe was fractured for a considerable part of its circumference, just above the



FIGS. 2 AND 3.—POINT OF CONTACT OF FEED-PIPE AND BRACE.

union, at the point marked *A*; the fracture seeming to indicate that the pipe had been subjected to a repeated bending action, which had ultimately caused it to break.

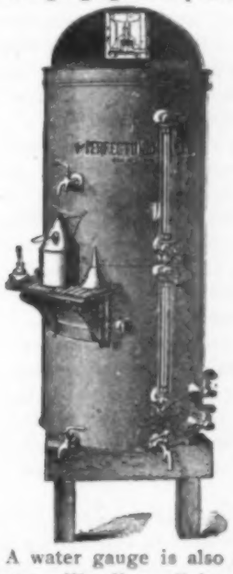
The way in which the corrosion occurred is shown in the outline cuts, Figs. 2 and 3. An elliptical area, marked *B* in Fig. 2, was corroded away to the depth of perhaps an eighth of an inch on the brace, just opposite the point of probable contact of the brass pipe; while the pipe itself showed no signs of deterioration, either at this point or elsewhere. It might be imagined that the action was possibly mechanical in nature, and that the loss of substance of the brace was due to the repeated contact and friction of the feed pipe against it; but in that case we should expect to find some abrasion on the feed-pipe itself, which was not the case.

Another very curious fact, of which we can offer no reasonable explanation, is that the brace was corroded not only at the point marked *B*, but also over a similar area situated symmetrically to *B*, but on the opposite side of the brace, as shown at C in Fig. 3. This second corrosion effectually disposes of the friction theory, unless it can be shown that at some time during the history of the boiler the corroded brace has been turned half way round. We could not learn from those in charge of the boiler that this had ever been done.

We have no theory that seems to give a satisfactory account of the cause of such corrosions as we find in this case, and we present the accompanying illustrations, therefore, not for the purpose of bolstering up such a theory, but simply because we think that they furnish still further evidence that brass should not be used for internal feed pipes. Heavy iron steam pipe is much better for internal use; and it is also cheaper; and the brass should be reserved for external use, it being especially valuable in cases in which the feed-water is likely to produce pitting, in iron pipes.—[The Locomotive.

PERFECTION OIL PURIFIER.

The distinguishing feature of the Perfection oil purifier, of which a view is given herewith, is its use of water only, dispensing with waste or filtering compounds. There is thus no loss of material and no diminution in the value of the oil. The admission of steam through valves in the lower portion of the purifier furnishes the heat needed, the aim being simply to have the water luke-warm. The impure oil is poured into a pan at the top, and a gauge glass is provided, indicating the



amount admitted. A water gauge is also attached, showing the height of the water. The dirty oil is conducted through a central pipe leading from the pan above to the bottom of the purifier and rises through the heated water to the upper portion, whence it is drawn off through the faucets. The claims for this type of purifier are that it will work all grades of oils, that it works automatically, that it greatly reduces the oil bill and keeps machinery in a better condition. It has been in use for a number of years and is sold by the Q. & C. Co., 700-707 Western Union Building, Chicago.

THE W. A. Jones Foundry & Machine Co., 57 and 59 S. Jefferson st., Chicago, reports that the opening of the spring season shows a very marked increase in orders for pulleys, shafting, hangers and general power transmission machinery. The company is at present employing a larger force of men than at any previous time in the history of its business. To keep up with the increase in orders it has been necessary to add several more machine tools, among which are a 50″ pulley lathe, and one of the Lodge & Davis Machine Tool Co's. latest 24″ lathes. The W. A. Jones Co. has an excellent catalogue under the title of "Power Transmission" which will be sent on application.

AMERICAN IRON AND STEEL WORKS IN 1896.

The current issue of the *Bulletin* of the American Iron and Steel Association gives an interesting summary of the various descriptions of iron and steel works in the United States at the beginning of the present year. General Manager Swank's new directory, to which this summary is the preface, is about ready for distribution. It is larger than any of its predecessors, containing 334 printed pages, and in addition to the old features presents a valuable new one, in a complete list of the malleable iron works in the country. In its completeness and its size, it exemplifies the progressive policy Mr. Swank has always followed. The Directory, like the statistics of the American Iron and Steel Association, has well established its title to leadership in literature of its kind.

It is noted in the introductory statement that an unusually large number of changes in the equipment of iron and steel works and in their officers have been made in the past two years; and a very large number of new iron and steel enterprises have been undertaken, sheet mills and tin plate mills being most prominent in this category. We give below a synopsis of the volume, abridging somewhat the statements of the preface:

Blast Furnaces.—In the Directory for 1876, 20 years ago, were enumerated and described 713 blast furnaces then active or expected some day to be active, their total annual capacity being 4,856,455 gross tons. The edition for 1892 showed 569 furnaces, capacity 14,550,708 tons; and the edition of 1894, 519 furnaces, capacity 16,271,027 tons. The present edition enumerates 469 furnaces, 100 less than in 1892 and 50 less than in 1894. Yet with this great reduction in the number of active or available furnaces the annual capacity has increased to 17,373,637 tons in 1896, or 2,822,929 tons more than in 1892 and 1,102,610 tons more than in 1894. In 1876 the average annual capacity of all the furnaces was 6,811 gross tons; in 1896 the average annual capacity is 37,044 tons. With 244 fewer furnaces than in 1876 we now have more than three and a half times the furnace capacity of that year. Merciless competition, better methods of manufacture, better ores and better fuel, favored manufacturing localities, the constant tendency to lower prices, and the crushing effects of the panic of 1893 have combined to place the manufacture of pig iron in this country in 1896 in few and strong hands.

The present edition enumerates 10 new furnaces in a more or less advanced stage of construction, and 14 other furnaces which have been projected. Of the furnaces that will surely be completed at an early day special mention may be made of the four new Duquesne furnaces of the Carnegie Steel Co., Ltd. These will each be 100 feet high by 22 feet in width at the boshes, and they will have an aggregate annual capacity of 700,000 gross tons. They will be the largest furnaces in the world.

The present edition transfers to the abandoned list 54 furnaces which were classed in 1894 among the furnaces that were then active or likely to become active at some future time. Of this number 21 are in Pennsylvania, five in New York, five in Michigan, four in Virginia, four in Wisconsin, three in Ohio, two each in New Jersey, Maryland, Tennessee, and Illinois, and one each in Massachusetts, Connecticut, Alabama and Missouri. Of five furnaces built or revived since the appearance of the last Directory, one is in New York, two are in Pennsylvania, one is in Tennessee, and one is in Ohio. Of the 10 furnaces now in course of erection or upon which preliminary work has been done four are in Pennsylvania, and four in Ohio, one is in Michigan, and one is in Utah. Of the 14 partly erected and projected furnaces one is in New York, three are in Pennsylvania, three are in Virginia, three are in Tennessee, and four are in Alabama.

Of the 469 furnaces described in the present edition of the Directory 96 use charcoal as fuel, against 118 in the edition for 1894, and 373 use anthracite and bituminous coal and coke, against 401 in 1894. The total annual capacity of the 96 charcoal furnaces is 1,098,550 gross tons, against 1,285,440 tons for the 118 charcoal furnaces described in 1894. While the aggregate furnace capacity has increased 1,102,610 tons from 1894 to 1896, that of the charcoal furnaces alone actually decreased 186,890 tons. The average annual capacity of the charcoal furnaces described in 1894 was 10,894 gross tons, and the average annual capacity of the charcoal furnaces described in 1896 is 11,443 tons. The average annual capacity of all the furnaces using mineral fuel in 1894 was 37,371 gross tons, and the average annual capacity of all the mineral fuel furnaces in 1896 is 43,633 tons.

Rolling Mills and Steel Works.—The Directory enumerates 505 completed rolling mills and steel works, of which 463 contain trains of rolls. The edition of 1894 described 487 completed rolling mills and steel works. In the intervening time 41 new rolling mills and steel works have been built, 22 have been abandoned, and one heretofore counted as completed has been placed in the list of mills commenced but not completed. The net increase is 18. In January, 1896, there were five rolling mills and steel plants in course of erection, against eight building and one rebuilding in the early part of 1894.

Puddling Furnaces.—The number of puddling furnaces connected with rolling mills in January, 1896, each double furnace counting as two, was 4,408, against 4,715 early in 1894, a decrease of 307 furnaces. The highest number of puddling furnaces reported was in 1884—5,265. In 1892 there were 5,120. Since that year the number has steadily declined, but not so rapidly as many have supposed. The most notable abandonment of puddling furnaces that has taken place in recent years has occurred at the American works of Jones & Laughlins Ltd. In 1894 this firm reported 92 single puddling furnaces as still forming part of its plant; in the present edition only 15 single puddling furnaces are reported, and on February 8 the last of these 15 furnaces was dismantled. Hereafter this firm will manufacture only steel.

Bessemer Steel Works.—Since January 1894 there have been build five new standard Bessemer steel plants—one at Lorain, O., by the Johnson Co., to make girder and T rails and street railroad specialties; one at Youngstown, O., by the Ohio Steel Co., to make sheet and tin plate bars, slabs, and small billets; one at Columbus. O., by the King, Gilbert & Warner Co., to make steel slabs, billets, and sheet bars; one at Alexandria, Ind., by the Union Steel Co., to make ingots, billets, bars, sheets, small rails, shapes, etc.; and one small converter at East Chicago, Ind., by the Potter & Hollis Foundry Co., of Chicago, to make steel castings by the Walrand-Legenisel process, the capacity of the converter being only 1,000 pounds. After running this converter for a short time in 1895 at East Chicago the company has removed it in 1896 to Chicago, where it is now in operation. A two-gross-ton Robert-Bessemer converter was also built at East Chicago, Ind., in 1894, by the Drexel Railway Supply Co., of Chicago, for the production of steel castings, but it was abandoned in 1895, after being operated for about one year. Since January, 1894, four standard Bessemer steel plants have been abandoned—one in Pennsylvania, two in Ohio, and one in Illinois, and in the same period one Clapp-Griffiths and two Robert-Bessemer steel plants have been abandoned. In addition to the above the partly completed four-gross-ton standard Bessemer converter at Sharon, Pa., work upon which was commenced in 1891 by the Sharon Steel Casting Co., has also been abandoned. Including the Walrand-Legenisel plant we now have 44 standard Bessemer steel works, with 99 converters, against 43 in 1894, with 95 converters. We also have three Clapp Griffiths and three Robert-Bessemer steel plants, with 10 converters, but even these are not all in operation. The annual converting capacity of all the standard Bessemer steel plants in January, 1896, built and building, was 9,472,350 gross tons of ingots and direct castings, against 7,740,900 tons in January, 1894. This is a very great increase. But few direct castings are made at Bessemer steel works.

Open-Hearth Steel.—We have built 11 new open-hearth steel plants since the appearance of the Directory for 1894, while four have been burned or abandoned, showing a net increase of seven plants. We now have 88 completed open-hearth steel plants, and in addition four new plants are now in course of erection—one in New York, two in Pennsylvania, and one in Indiana. The annual capacity in ingots and direct castings of the open-hearth steel plants in January, 1896, built and building, was 2,430,450 gross tons, against 1,740,000 tons in January, 1894, a surprisingly large increase. During the past two years rapid progress has been made in the manufacture of basic steel in open-hearth furnaces.

Open-Hearth Steel Castings.—In 1894 there were 28 open-

hearth plants which were prepared to make direct castings, and in 1896 there are 35 plants which are similarly equipped. In addition one plant for the manufacture of open-hearth steel castings is now being built. The manufacture of steel castings has grown so rapidly in late years that it has wrought a great change in our general foundry practice.

Basic Steel.—The manufacture of basic steel in this country is now wholly confined to works which have open-hearth steel plants. At a large number of these works basic steel is now regularly manufactured, and at some works it is almost if not altogether exclusively manufactured. We know definitely that about one-half the open-hearth steel works of the country which produce ingots now make basic steel. While the manufacture of basic Bessemer has no existence in this country today, the Troy Steel Co. proposes to make basic Bessemer with three 15-gross-ton converters at its new works now being erected on Breaker Island.

Crucible Steel Works.—The Directory enumerates three crucible steel plants less than in the edition of 1894, eight plants having been abandoned in the meantime and five having been built. We now have 45 completed crucible steel plants, against 40 completed and one building in 1894. The aggregate annual capacity of the existing crucible steel works is 98,700 gross tons.

Cut Nail Machines.—In January, 1892, there were 65 rolling mills devoted in whole or in part to the manufacture of cut nails and spikes, and which contained 5,546 nail machines. In January, 1894, there were 55 mills and 5,094 nail machines. In January, 1896, there were 53 mills and 4,598 nail machines. These figures show a decrease of 948 nail machines in four years.

Wire Rods and Wire.—The present Directory enumerates 23 works which are equipped for rolling iron or steel wire rods, against the same number in 1794, and 73 completed iron or steel wire drawing plants, and in addition one plant to be rebuilt, against 64 in 1894 and one in course of erection.

Wire Nail Works.—In January, 1894, there were 54 completed and one partly-erected wire-nail works. In the present Directory are enumerated 53 completed wire-nail works and one works to be rebuilt. The capacity of the wire nail works is now much greater than in 1894, the nominal decline in the whole number possessing no significance.

Structural Steel.—The works which make structural iron and steel are classified with the rolling mills and steel works. Of these there are about 40, but a few are now idle and others make only small sizes of structural material. Most of the large works make only steel shapes. During the past two years our capacity for the production of structural material has greatly increased.

Plate and Sheet Mills.—Included in the rolling mills and steel works already mentioned are the plate and sheet mills. Of these we now enumerate and describe 156 completed plants, three in course of erection, and two partly completed. In 1890, before our tin plate industry had obtained a foothold, there were 129 plate and sheet mills and three in course of erection. Most of the new mills that have since been built have been designed to meet the demand for black plates, or sheets, for tinning and terne plating, and many of the mills which were in existence in 1890 have been enlarged or changed to meet the same demand. In the present edition of the Directory 41 completed rolling mills are specifically named as making black plates for tinning, while three works of like character are in course of erection. Our armor-plate works are included with the plate works. For two years and more they have fully met the exacting requirements of the Government for the supply of armor plate in the construction of our new navy.

Tin Plate Works.—In the annual report for 1890, printed in April, 1891, it was announced that at three works in the country bright tin plates were then manufactured and that terne plates were manufactured at another works, while two additional tin plate plants were in course of erection. It was also stated that "other firms and companies are reported to be considering the advisability of engaging in the manufacture of tin plates and terne plates." The Directory for 1892 enumerated and described 20 works which were either making or were prepared to make tin plates or terne plates, and 10 additional works were in course of erection. The Directory for 1894 described 56 completed works, two building, and one additional works which was partly erected. The present edition describes 69 completed works, four in course of erection, and one works which are being rebuilt. Practically all the works now erected have been built since the passage of the tariff of 1890.

Forges and Bloomaries.—Under this classification enumerate only the works which make wrought iron direct from the ore and works which make blooms from pig iron or scrap iron, for sale. The Directory for 1894 enumerated 25; to-day there are 23, most of which are pig-and-scrap forges. In the whole South, where formerly there were literally hundreds of Catalan forges making small quantities of wrought iron directly from the ore, there is now only one active forge of this character left—Helton Forge, at Crumpler, Ashe county, North Carolina. In 1876 there were 27 forges in New York which made iron directly from the ore; there are now only seven.

Miscellaneous Works.—In addition to the works already mentioned, the present edition shows 27 completed stamping works and one rebuilding; 74 iron and steel bridge building works; 36 iron and steel shipbuilding yards; 13 horse-nail works; 22 locomotive works; 82 malleable iron works; 70 completed cast iron and cast steel pipe works and one partly erected; 38 completed wrought iron and wrought steel pipe, iron and steel riveted pipe, and seamless tube works, and one building; 64 completed car-axle works and two building; 112 completed car-wheel works and one partly erected; and 112 car-building works.

Natural Gas.—The present Directory enumerates 89 completed works which use natural gas in whole or in part, exactly 10 more than two years ago—45 in Allegheny county, Pa., 16 in other counties of Western Pennsylvania, one in West Virginia, five in Ohio, and 22 in Indiana. One works now being built in Indiana will also use natural gas. It is in Indiana chiefly that the use of natural gas in iron and steel works has been extended during the last few years. In January, 1892, only six works in that state used this fuel. The total consumption of natural gas in iron and steel works is growing less and less.

Canada and Mexico.—Canada now has eight blast furnaces and 15 rolling mills and steel works, while Mexico is credited with 14 blast furnaces and six rolling mills and steel works. A new and large furnace has just been blown in at Hamilton, in Canada, and another rolling mill is being built in Canada. The iron and steel industry of the Dominion is making excellent progress.

A New Molding Sand.

A new molding sand for the production of thick castings, free from blowholes, has recently been introduced by Messrs. Kuhlmann Bros., of Grüne, near Iserlohn, Westphalia. The molding sand is first burnt hard, then finely ground and afterwards mixed with sal ammoniac dissolved in water. It is claimed that in a casting made in sand prepared as above, when the metal comes in contact with it, a layer of steam and hydrochlorate of ammonia is formed between the metal and the sand, thus preventing the metal from running through the sand, and allowing of the production of a clean casting.

THE paper published in these columns last week on the "Walrand-Legenisel Process for Steel Castings," which has its American exemplification at the works of the Potter & Hollis Foundry Co., at Chicago, makes pertinent this paragraph from a foreign exchange: "Walrand and Legenisel, of Paris, have just completed and put in operation two of their special types of plant at the works of the Société Franco-Russe, and the Baltic Works in St. Petersburg. At the first-named works there is only one 300-kilog. converter, while at the latter there are two of 800 kilog. As a result of the success attained at the last-named works, the authorities of the Obouchov State Foundry have decided to put down a plant of the same type."

CHICAGO'S Southern Exposition project is under way, the Southern States Exposition Co. having been incorporated at Springfield, March 3, with $100,000 capital. The incorporators are Edwin Walker, E. F. Lawrence, A. F. Seeberger and Malcolm McNeill.

A PRODIGIOUS boiler contract is to be let at Chicago in the next two months, involving 64,000 h. p., all water tube boilers

COKE FOR THE FOUNDRY.—III

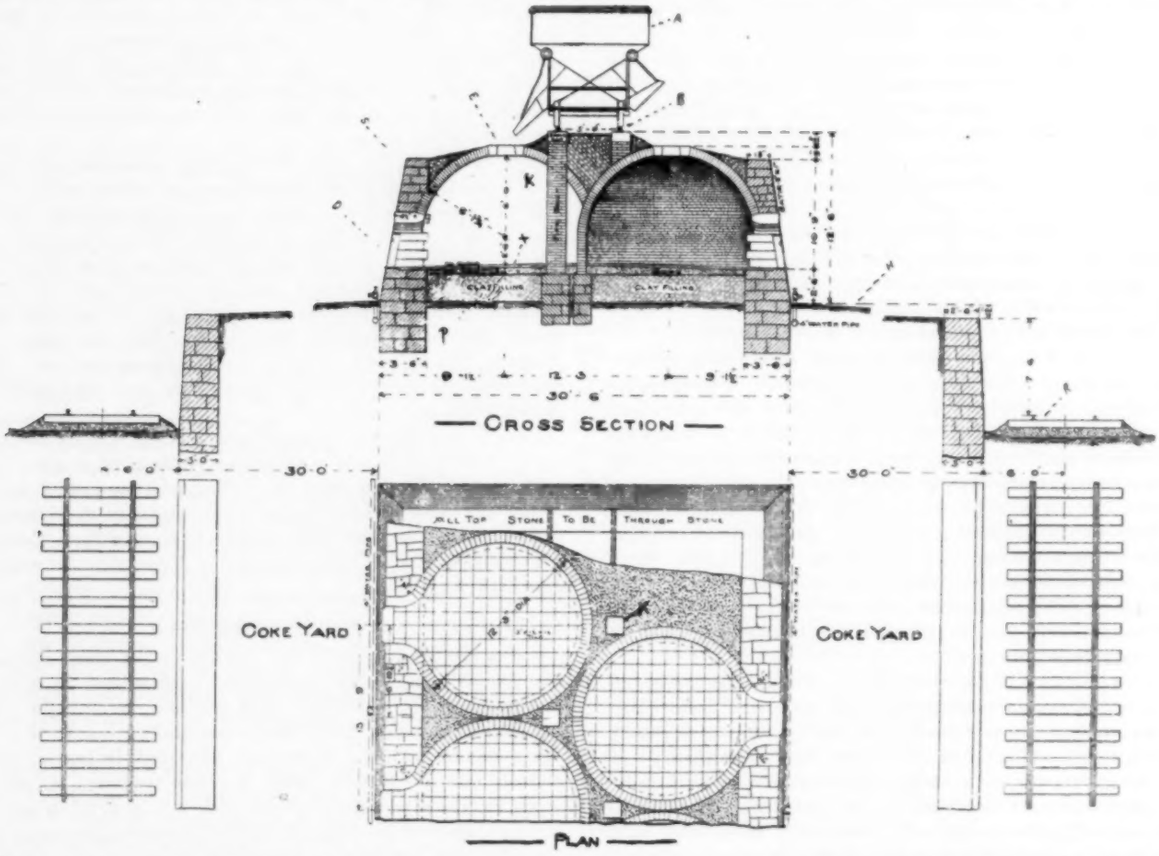
Its Characteristics, Methods of Manufacture and a Founder's Experience with It.

BY THOS. D. WEST.

The terms "48-hour coke" and "72-hour coke" refer to the time the coal is subjected to the process of coking in the oven. Seventy-two hour coke is generally due to Sunday coming in as an odd day and one upon which the cokers are taking their rest. The preference of founders for 72-hour coke is not always accompanied by the assurance that it has the high quality that many claim for it. My experience in using both the 48-hour and 72-hour, or two or three-day, coke does not warrant me in encouraging the prejudice which seems born more of general supposition than real knowledge. I have melted with all furnace, or 48-hour coke, for six months at a stretch, employing occasional analyses to keep a check on the sulphur. If it was found too high, the coke was used in the drying ovens. The heats ranged from 40 to 60 tons with strictly all pig iron in a cupola, having an inside diameter of 66″, and I cannot say that the simple fact of its being a 48-hour coke caused it to be unsatisfactory. Nevertheless, there are conditions about 48-hour coke which are very apt to make it of less value as a good melter than 72-hour coke. These arise from the fact that 72-hour coke is generally selected with greater care and is generally a firmer fuel, with the probability of containing less sulphur than 48-hour coke. As solid a coke can often be produced from a 48-hour as from a 72-hour burning; but owing to the conditions permitting a furnace to use a smaller and more dusty coke with less evil results than are apt to follow in cupola work, 48-hour coke is not selected or handled with the same care as 72-coke, and hence the former will give a greater yield from the coal used. This permits it being sold at a lower price. If the same care was taken in burning and selecting the 48-hour coke as with the 72-hour product, the chances are that the former could generally give good satisfaction in cupola melting. There are times when coal is only coked 24 hours, but this product is not considered at all suited for melting or smelting purposes, although coke makers have been known, it is said, to ship 24-hour coke for the 48-hour article.

PROCESS OF WASHING COAL.

The bituminous coal used for coking may be in lump or slack form. It is often found containing iron pyrites or sulphur and slate to such an degree as to require that it be "washed." This consists in crushing the coal, if it is of lump form, so as to make it fine like slack, and then carry it by means of buckets attached to an endless chain from boat, car or crushers to tubs of water so arranged with "jiggers" that a constant agitation and flow of the water causes the different elements in the coal to take their place in the water according to their different specific gravities. The sulphur and slate, being heaviest, sink to the bottom, and by a series of jigging tubs, through which the coal is passed, the floating bodies—the coal, partially freed of its sulphur and slate—is caught by perforated iron buckets, on an endless chain and carried to a dump pile or to the "larries," an iron rigging used for carrying the coal to the ovens to be charged for coking. The impurities in the form of slate and iron pyrites which had sunk to the bottom are passed along through the shutes with the outflowing water to the refuse bed. There is much difference of opinion as to the value of washing coal, some claiming that the money spent in erecting a washing plant, which is often a large sum, would be better spent in developing and purchasing good coal lands, and again, that the washing process often removes bitumen with the slate to such a degree as to rob the coal greatly of its coking qualities. Best authorities advise that good coal be always used, in order to obtain good coke.



CHARGING THE COAL.

In conveying the coal to the oven, sufficient is generally carried by one larrie, A, to fill an oven at one charge. This larrie runs on a track over the top of the oven as shown at B, Fig. 1 (which, with the other illustration, from drawings by Wilkins & Davison, of Pittsburg, is taken from Part III, of the Annual Report of the Secretary of Internal Affairs, State of Pennsylvania, for 1893.) By a handy dumping arrangement the coal may be delivered into the ovens on either side of the track. After the coal has been dumped into the ovens through the hole E it is leveled by means of a long-handled hook. This done, the door D is then partially closed by means of bricks loosely laid or luted with clay or loam, an opening of about six inches being left at the top of the door for the admittance of air to support combustion in the oven. As the coking progresses, the opening for the admittance of air is occasionally made less and eventually closed, in connection with the charging opening E.

Combustion of the coal results from the heat which the oven contains from the previous coking. As soon as the coal is ig-

nited, which is about an hour after it is charged, a black smoke, combined with a greenish vapor and occasional outbursts of flame, passes up through the charging hole E which is left open to create draft and permit the escape of all smoke and vapors that may emanate from the coal. The gas which escapes has a very offensive odor, generally strong of sulphur. The smoke generally ceases in from 10 to 12 hours after the first ignition of the coal, after which a bright flame passes through the opening E and covers the entire surface of the coal, which by this time has attained almost a white heat. This process continues until the bright flame dies out and then the coal simply becomes one mass of red-hot coals containing about one-third of the volatile matter originally in the coal, two-thirds having passed off during the time that the body of the coal was raised to its highest temperature. As soon as the 48-hour or 72 hour coking period, as the case may be, has matured, or the oven is "around," a stream of water from a one-inch hose (or the water may be thrown by buckets) is sent in over the top surface of the glowing mass, to extinguish the fire. It is very important to cool off or stop all further combustion at this point of the coking, as, if permitted to continue burning, the fixed carbon of the coal would be rapidly consumed thus causing a material loss of combustible

The main principle in coking being the admission of the air to support combustion at or over the surface instead of causing it to pass up through the coal, as in burning fuel for firing boilers, etc., prevents destruction of the coal while coking and cause it to "cake" or become the coke of industrial commerce. Instead of the fire burning from the bottom upward, it burns downward, creating an action of distillation more than one of combustion. Some of the carbon in the coal is lost in the process of coking, as previously stated. If cooled off with water at the proper time the percentage of carbon lost during coking rarely exceeds 20 per cent and may not go over 10 per cent. The amount of the loss is due to many factors. One may be the indisposition of the coal to coke and again there may be causes local with the ovens and their treatment. Some have followed the practice of drawing the coke from the ovens before cooling it off with water, but this practice is now largely obsolete. The method of cooling the coke on the inside of the oven is hard on the bricks composing the interior, but it makes easier and more comfortable work for the cokers and is at the present day considered to be the better method of the two, in so far as it relates to the question of moisture in coke, as it is claimed the product absorbs less water by being cooled off inside than outside of an oven.

The amount of coal charged into such a bee-hive oven as described herewith covers the floor to a depth of about two feet for 48-hour coke and 2½ feet for 72-hour coke and in weight ranges, according to the diameter of the oven, from about 3½ to 6½ tons.

WATER IN COKE.

The amount of water in coke can range from 2 to 20 per cent. As it takes about 15 lbs., of coke in a cupola to evaporate one pound of water, it is evident that the less water coke contains the more economy in melting or the less fuel required. Some firms recognize this factor and build stock houses for keeping the coke under cover. It should be remembered that coke which has been subjected to rain, mist or snow requires a greater percentage to obtain the same fluidity than if it had been a dry coke. It is claimed that exposing coke to rain and sunshine, or out-door weather, will reduce its sulphur. To what extent this is true, the writer is unable at present to state.

DRAWING THE COKE.

The water having cooled off the glowing mass, the next process is that of drawing coke from the oven. This is a sight to enliven one's imaginative powers and suggests to a founder the changes heat makes in iron charged into a cupola; it goes in as a hard, solid body and comes out a beautiful seething mass of fluid metal. The coal as it lies "caked" or "coked" in one solid mass, is full of vertical seams or cracks caused by the sudden cooling of the glowing mass by the water. These seams put one in mind of a partially quartered piece of fruit, only awaiting the insertion of a little force to finish its separation. The cokers insert their hooks between these seams in drawing the coke from the oven. It is landed on the coke wharves H, from which is loaded into cars standing on the track R, and shipped broadcast to consumers. The care exercised and the time taken in drawing the coke from the oven has much to do with its size, freedom from breeze or small coke, and the yield of coke. The method adopted for obtaining "selected coke" lies in picking out the "black ends" and fine as well as soft or poorly burned coke. As soon as coke has been withdrawn, the oven is again filled with a charge of coal, the drawing door closed and the heat of the oven from the previous coking, as stated before, ignites the fresh coal and "another heat is on," as the founder would say.

METHODS OF COKING.

The method generally used for coking in the United States is that found in the bee-hive oven as illustrated in Fig. 1. These ovens are generally built from 10½ to 12 feet in diameter and from five to seven feet in height. The outside circle is placed within that of two as shown in the plan view, for the purpose of admitting general uniformity of expansion and heat among the ovens. The interior of the oven is all fire brick and the space between the ovens is packed with clay or

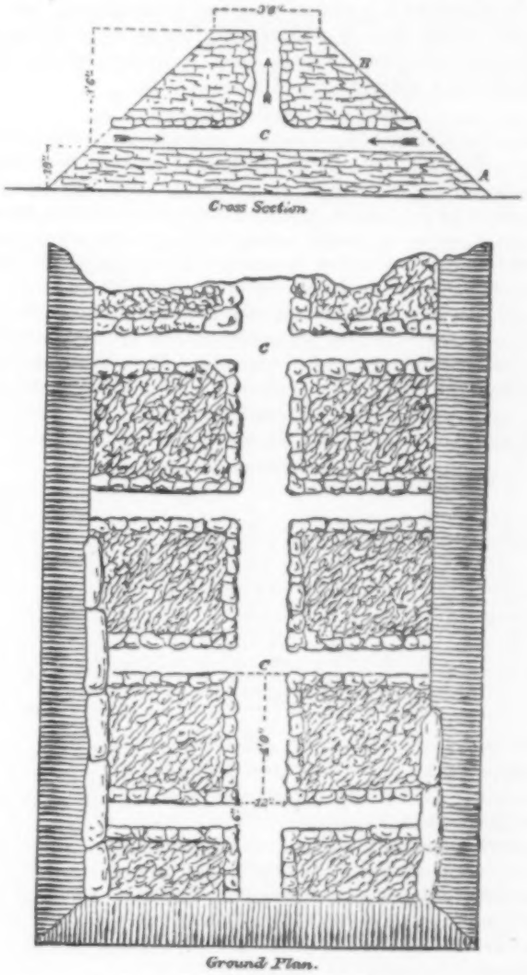


FIG. 2—COKING IN MOUNDS.

loam. Pillars, as at K, are used for the support of the larries on the track B so as to take their weight off the arch of the ovens. The outside of the ovens at S are built of stone and are made very strong. The filling is all clay or loam, and the floor X is composed of tile fire brick. Most all the details here given are those which the author took note of while inspecting the methods, etc., of coking as described heretofore.

Coal is sometimes coked in mounds, heaps or piles, similar to the method used for making charcoal from wood. By such methods of coking, the coal must be chiefly in lumps and piled in a manner to leave all the possible air space that is practical through the body of the mounds, etc.; and also have it piled so as to have as little of it touch the ground as possible. The mounds or piles are generally built around a brick chimney laid with loose bricks, left as full of holes in every other course in height as is practicable so as to provide openings for draft from the outside of the mound at various heights. These piles range from 15 to 30 feet in diameter and from four to seven feet in height. They are set on fire by

means of openings left in their body where wood or light brush can be inserted. Some piles are built in an oblong form, often running 200 feet or more in length, with a base in width of from 12 to 16 feet. The plan of building such long piles is to lay a body of coal about 16 inches high and then commence the formation of flues as seen at C, Fig. 2.

These flues are filled with wood, brush or any light kindling and then set on fire at every other opening, the aim being that no one part of the pile burn faster than another. If a fire should be too strong at any one point, the outside surface is banked with fine coke dust or earth, and applied to the surface of the whole structure as soon as the gaseous matter has stopped burning, so as to smother the fire and complete the coking of the coal. The last operation with this method of coking, is to pour a little water down the vertical flues, so as to diffuse steam throughout the whole body of the coke, which it is claimed is beneficial, resulting in the least moisture in the coke. It takes from five to eight days according to the state of the weather to perfect coking by this plan, which was used for coking in the Allegheny Mountains. The coke produced by it is said to be of very good quality; but as a general thing, there is considerable loss in the yield where coal is coked in mound or heaps, and the method has the disadvantage of requiring the coal to be in lumps.

YIELD OF COKE FROM COAL.

The coke obtained from heaps or mounds generally ranges from 50 to 55 per cent of the coal charged, whereas with oven coke the yield is from 60 to 70 per cent. The long mounds are said to be productive of better coke and furnish a larger yield than round or small oblong piles, having simply one center draft provision as heretofore described. It is only where it is costly to secure building material and coal is cheaply obtained, or where the coking qualities of coal are desired to be tested before expensive ovens are erected, that mounds are generally used to coke coal. The following table showing the yield of a few different grades of Connellsville coke, prepared by John Fulton and published in the *American Manufacturer* of Feb. 10, 1893, will prove of interest:

YIELD OF COKE FROM COAL.

No. of test.	Time in oven.	Coal charged.	Ash made	Fine coke made.	Market coke made.	Total coke made.	Per cent of yield. Ash.	Fine coke.	Market coke.	Total coke.	Per cent lost.
	h. m.	lb.	lb.	lb.	lb.	lb.					
1	67 00	12,420	99	383	7,518	7,903	00.80	3.10	60.53	63.63	35.57
2	68 00	11,090	92	359	6,580	6,939	00.81	3.24	59.33	62.57	36.62
3	45 00	9,120	77	272	5,418	5,691	00.84	2.98	59.41	62.39	36.77
4	45 00	9,020	74	349	5,334	5,683	00.82	3.87	59.13	63.00	36.18
		41,650	340	1,365	24,850	26,215	00.82	3.28	59.66	62.94	36.24

The above table shows that 48 and 72-hour coke varies more or less in the length of time such designated coke is actually in an oven and that the actual time coal is coked is largely regulated by local conditions favorable to suit the best working convenience of the cokers in going their rounds of the ovens, and in one sense, we might say, instead of 48 and 72-hour coke, one-day or two day coke. It also clearly illustrates the loss of coal in the form of what is generally called "braize" or small fine coke and that of the ash produced by the burning of coal.

It is claimed that where machinery is used instead of mules and hand labor for charging ovens, the coal is generally insured a longer coking than 48 or 72 hours, the reason given being that by the use of machinery the ovens can be charged earlier in the day, than is practicable with mules and hand labor.

QUALITIES OF COKE IN DIFFERENT SECTIONS.

It was at one time generally thought that Connellsville coke could not be equalled and that any other variety was unsuited for cupola or smelting work. But of late years experience with other cokes has shown such opinions to be greatly in error, and to-day localities shown in the following table of John R. Procter, given in the Kentucky Geological Survey Report, are furnishing large quantities of good coke to founders and furnacemen. The table also presents a chemical analysis of the various brands of coke mentioned.

ANALYSIS OF COKE.

Where made.	Fixed carbon.	Ash.	Sulphur.
Connellsvil'e, Pa. Average of 3 samples.	88.96	9.74	0.810
Chattanooga, Tenn. " " 4 "	80.01	16.34	1.595
Birmingham, Ala. " " 4 "	87.19	10.54	1.195
Pocahontas, Va. " " 3 "	92.53	5.74	0.597
New River, W. Va. " " 8 "	92.38	7.21	0.562
Big Stone Gap, Ky. " " 7 "	93.23	5.69	0.749

As a general thing, chemical analysis of any certain brand is not an evidence that all coke coming from such ovens will always be up to the test reported, for there are many chances of conditions changeing so as to create different chemical and physical properties in coke from the same ovens. The safest guide is the general reputation of a coke and personal experience in using any special brand. This is not saying a chemical analysis of coke is not valuable. A chemical analysis of any shipment will approximate the constituents of such coke. There are cases where it will pay a founder to assure himself fully as to the chemical properties of coke in his yard before he uses it. In sampling coke for analysis much more should be selected than is actually required, and what is selected should be carefully picked from different parts of the pile, owing to conditions often causing a variation in the chemical qualities of coke from the same oven and the chance of the product of two or more ovens being mixed in the same car.

Whatever brand or quality of coke a founder may use, he can not be too exacting in striving to obtain the best. A poor coke for melting purposes, at any price, is an investment sure to lead to loss in the end.

NATURAL COKE.

Few are aware of there being supplies of natural coke. Appleton's Encyclopedia cites a bed existing on both sides of the James River and near Richmond, Va. It is said to be hard, very uniform, dark in color but rather porous. It is claimed to be serviceable for melting purposes.

Balance Sheet of a German Steel Works

Our contemporary, *Stahl und Eisen*, gives the following figures taken from the report of the Gütehoffnungs Hütte Mining & Smelting Co., of Oberhausen, in Westphalia, which may be of interest as giving an idea of the conditions governing the iron trade in Germany. The business is a very large one, combining coal, lime and ironstone mining, blast furnaces, foundries, forges and rolling mills, with general mechanical engineering and bridge building. During the period under review—1894-'95—the average number of blast furnaces blowing was 7.48, the bulk of the ore being purchased. The capital of the company is about £800,000, preference and ordinary shares receiving 5% and 4% dividend respectively.

OUTPUT, YEAR 1894-'95.	Metric tons.
Coal	1,294 354
Iron ore	168,175
Limestone	53,669
Pig iron	276,773
Malleable iron and steel	189 861
Machinery, boilers, bridgework, castings, etc.	30,839
Total number of hands employed	11,313
Wages paid	£579 409

TAXATION.		
State income tax	£2,337	
State trade tax	472	
State ground and building tax	586	
Local income tax	6,590	
Mining taxes (nine months)	5,226	
		£15,211
Contributions to Works' Sick and Pension Fund	£3,936	
" " " Miners' Fund	6,655	
" " Rhenish-Westphalian Smelters' Common Fund	5,258	
Contributions to Rhenish-Westphalian Miners' Common Fund	5,747	
Contributions to Imperial Pension and Insurance Fund	3,932	
		£25,528

The amount paid in taxes and compulsory benefit funds was larger than the dividend paid to the shareholders, the former corresponding to 5.08%, and the latter to 4.62% on the capital. Or looking at it in another way, 60% of the divisible profits were assigned to the shareholders, and 40% to the benefit and insurance funds for the workmen. The contributions to the funds represent 4.46% on the wages paid.

In the commencement of the report the directors state that the improvement in business, in January, 1894, consequent on the Treaty of Commerce with Russia, was not maintained, and bars and plates were depressed at times below prime cost. This was especially the case with shipbuilding materials, which, being free from import duties, could be supplied from England to German shipyards at prices which excluded the producer, burdened with social political loads and suffering from high railway freights. Thus, it appears that the railways are singled out in Belgium, as in England, as the direct cause of bad trade. This is scarcely consistent with the report of the Iron and Steel Trade Association.—[The Engineer.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review* and we will put you in communication with our advertisers at once.]

John B. Keech, Tarboro, N. C., will want a punching machine to punch one-quarter to one-half inch hole in sheet iron.

Sears & Conroy have started the American Wind Engine Works at Topeka, Kan., to manufacture a new wind mill invented by Mr. Conroy.

The Royal Pedal Co. has been incorporated at Chicago, with a capital stock of $10,000, to manufacture bicycles, by Julius Moses, F. D. Lieber and Marie T. Kendig.

The Novelty Mfg. Co., Box 469, Winchester, Ky., will purchase equipment for work similar to clock mechanism; also screw-cutting lathe 8x36 inches, three speed lathes 8x30, two drill presses, emery grinder and one tapping machine.

The Townsend Furnace & Machine Shop Co. has been organized at Albany, N. Y., with a capital stock of $80,000. The officers are: Franklin Townsend, president; Ledyard Cogswell, vice-president; John T. Brad, secretary and treasurer, and Ezra Loughren, superintendent. The products of the company will be mill gearing, machinery and machinery castings of all kinds, pattern making and general job work.

Additions, Enlargements, Removals, Etc.:—

Caskey Bros. of Philadelphia, Pa., have purchased the Newport News Iron & Brass Foundry of Newport News, Va. The foundry will be enlarged and improved.

The addition recently erected by the Hoppes Mfg. Co., of Springfield, O., is now ready for occupancy. It gives in all about 5,328 square feet of available floor room.

The Fair-Day Foundry Co., Knoxville, Tenn., is building additions to its pattern shop, 40x95 feet, and its foundry building, 65x80 feet, a new cupola house, new power house, etc.

The Franklin Steel Casting Co., Franklin Pa., will add another 15-ton open-hearth furnace to its plant, and will erect an additional foundry, 300 by 150 feet, and make additions to the pattern shops of 100 by 50 feet, and will also install a 25-ton electric crane.

The Anniston Pipe & Foundry Co., of Anniston, Ala., has purchased the pipe works plant in that city, which it has been operating under a lease, and will make extensive improvements at once. An additional pit will be put into operation for molding 60-inch pipe.

Jones & Laughlins, Ltd., of the American Iron & Steel Works, at Pittsburg, have bought a large piece of ground adjoining their present plant which will be utilized for additions which are soon to be made. Within a short time this firm will have one of the most complete and modern open hearth basic steel plants in the United States.

We are officially advised that the addition being made to the plant of The Morton Tin Plate Co., Cambridge, O., consists of a new tinning house 110 feet long by 40 feet wide, 24 feet high. The structure will be built of hollow tile. Two large Morewood tinning sets will be placed in the building, and bright charcoal plates will be produced, from IC to IXXXXXX, varying in size from 10″x20″ up to 28″x50″, including all intermediate sizes; all the plates will be made by the palm oil process. The company states that its plant has been in continuous operation during January and February, the dullest months of the year, and the prospects are good for future business. This company has contradicted the report that it is erecting flux tinning pots. It now states that while it appreciates the fact that there are many purposes for which flux plates are suitable, it has chosen a special field in the tin plate business and will only make high grades of goods. Its output amounts to about 22 tons of black plates per day, and nearly all of this quantity will be used in making heavily coated terne plates and bright charcoal plates. A large cistern is also being excavated in solid rock, into which water will be filtered before being pumped to pickling house and boilers.

New Construction:—

The Southern Railway has bought land at Salisbury, N. C., for new machine shops to be built at that town, to do the repair work for the Western North Carolina Division and the Northwestern North Carolina road. The shops will employ over 100 men at first.

George H. Holliday, of Ironton, O., has nearly completed arrangements for the erection of a large stove foundry at Knoxville, Tenn.

The McRae & Roberts Co., Detroit, will move into its new factory, about April 1. The factory and office building will be 50x190 feet, and three stories. The foundry will be 50x140 feet and one story. The officers of the company are W. D. McRae, president and general manager; D. H. Roberts, vice-president and superintendent, and H. B. Anthony, secretary and treasurer.

Fires and Accidents:—

The foundry operated by E. W. Bailey, at Sharpsville, Pa., was totally destroyed by fire Feb. 24 with a loss of nearly $5,000. It was 40x60 feet, and well equipped. The machine shop adjoining was saved. Mr. Bailey had plenty of orders on hand.

The plant of the Kurtz & Buhrer Foundry Co., Austin ave., Chicago, was almost completely destroyed by fire Feb. 24. The loss is estimated at $100,000, of which $25,000 is on building and $75,000 on contents. The five-story brick building, 75 by 125 feet, containing the offices, storerooms, and machine shops, was destroyed with all its contents, as was also the two-story building containing the pattern and carpenter shops. The only building saved was the single story foundry which reached back to the Northwestern tracks. The books and papers of the company were saved. The insurance hardly covered the loss.

General Industrial Notes:—

The furnace at Temple, Burks Co., Pa., has closed down for repairs.

A strike of fillers at the Douglas furnace, Sharon, Pa., the men demanding two additional fillers, has been settled.

The puddlers of the Catasauqua, Pa., Mfg. Co., have accepted a conditional reduction of rates to $2.75 per ton on condition of steadier employment.

The Crown Point Iron Co., at Crown Point, N. Y., has gone into the hands of receivers, Talbot Olyphant and Thomas Montague being appointed.

Two of the new Duquesne blast furnaces of the Carnegie Steel Co., Ltd., are nearly completed and it is expected they will be put in blast in May.

The Miller Gas Engine Co., Springfield, O., is now engaged on a number of 50-h. p. engines, designed to be directly connected with dynamos.

The board of directors of the Michigan-Peninsular Car Co., of Detroit, Mich., has declared a dividend of one per cent on the preferred stock of this company.

W. M. Kerr & Co., of Pittsburg, representing the Cook water tube boiler, has been awarded an order for boilers of 300 h. p., by Brown & Co., Inc., of Pittsburg.

The Frank C. Patton Co., Sycamore, Ill., has changed its name to the Sycamore Foundry & Machine Co., and decreased its capital stock from $75,000 to $50,000.

The Cady Mfg. Co., Cleveland, has perfected arrangements to manufacture the improved Hackney power hammer and is prepared to make prices on all sizes of hammers.

The Barney & Smith Car Co., of Dayton, has taken an order for 1,000 freight cars for the Wheeling & Lake Erie Road and 450 freight cars of the recent New York Central order.

Kittanning furnace and also the muck mill of the Kittanning Iron & Steel Mfg. Co., Kittanning, Pa., are in operation. The output of the muck mill is sold to Pittsburg consumers.

All repair work at the Lochiel furnace, at Harrisburg, Pa., has been stopped by the Pennsylvania Steel Co., and it is not probable that the furnace will start before summer. The lining is about completed.

Sharon furnace, Sharon, Pa., owned by Boyce, Rawle & Co., was sold Feb. 27 to James Rawle, of Philadelphia, for $29,500. The sale was made in settling the Boyce estate. It is reported that the furnace will shortly be put in blast.

The Baldwin Locomotive Works, of Philadelphia, are at present engaged upon the construction of an electric mine locomotive for the Crozier Iron Co., to be used in the iron ore mines in Virginia. This is the first electric locomotive to be built upon order by the Baldwin-Westinghouse combination

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Work is in progress upon the trucks for several of their locomotives for various purposes.

The Philadelphia Bridge Works and the Reading Rolling Mill Co., which are controlled by the same officers, have gone out of the hands of receivers. F. H. Saylor is president of both corporations, and Geo. W. Corbett, business manager.

James V. Rose, of the Sharon, Pa., Fire Brick Works, has been awarded the contract for the erection of 25 patent Semet-Solvay by-product coke ovens for the Sharon Iron Co. The product of the ovens will be used at the company's furnace.

Armstrong Bros. Tool Co., Chicago, announces in connection with the removal of its office and salesroom to 98 W. Washington st., that it will not only carry a full line of its own tools but also a full line of machinists' tools, bicycles and bicycle sundries.

The Phœnix Iron Works, of Phœnixville, Pa., have contracted to build for Percy G. Williams, of the Bergen Beach Co., a Ferris wheel 200 feet high. About 100 tons of steel will be used. It will be lighted by 500 incandescent lights. There will be 14 cars, each with a seating capacity for 16 people.

The Totten & Hogg Iron & Steel Foundry Co., of Pittsburg, has just closed a contract with the Ironton Structural Steel Co., of Duluth, for a 36″ blooming mill. It is now shipping to the Duluth company a special mill for rolling beams and a pair of reversing engines, as well as a lot of special rolls.

The property of the Walker Mfg. Co., Cleveland, who have made a specialty of cable railway and electric equipment, compress machinery and other heavy work, has been acquired by the Walker Co., an organization taking in New York and Cleveland capital. The lines of the company's operations will be extended and its facilities considerably enlarged.

At Mt. Vernon, O., Frank Moore was appointed receiver for the Cooper-Roberts Mfg. Co., the well known engine manufacturers. The value of the plant is about $36,000, with liabilities other than stock of $20,000, the plant being mortgaged for $10,000. The present company was organized in 1893, succeeding the Cooper Mfg. Co. It has no connection with the C. & G. Cooper Co.

Armstrong Bros. Tool Co, manufacturers of the Armstrong tool holder, for general lathe and planer work, 78 Edgewood avenue, Chicago, has opened a down town office and salesroom at 98 West Washington street. The company proposes to carry a full line of machinists' fine tools, as well as its own goods, of which it is now making larger sizes than heretofore specified in its circulars.

The receiver of the Joliet (Ill.) Enterprise Co. has been ordered by the circuit court to advertise the sale of the company's mills to take place on April 8. This company went into bankruptcy three years ago, with large liabilities, following the failure of the Stone City Bank, which was controlled by Fish Bros., who owned the Enterprise Co. The mills cost $300,000, and are ready to be put in operation.

In connection with the reorganization of the Bucyrus Steam Shovel & Dredge Co., of South Milwaukee, there has been this recent development: A decree has been entered in the case pending in Milwaukee, approving the undisputed claims filed with the court, ordering a sale of all the property of the company and authorizing holders of first mortgage bonds and unsecured claims to use these in its purchase. The exact date of sale has not yet been fixed, but it is expected to take place about March 15.

The Bellaire Nail Works, Bellaire, O., having discontinued the manufacture of nails, the present name of the company has become inappropriate. After Feb. 28, it is announced, the business will be conducted under the name of Bellaire Steel Co. The works of the company are being greatly enlarged, and in addition to manufacturing pig iron and Bessemer steel blooms, billets and slabs, the company will be prepared at an early date, to furnish sheet bars, tin plate bars, bridge plates, skelp, and other material.

Several manufacturing plants at New Castle, Pa., idle for some time have resumed recently. The *Guardian* says that

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1—38″x14′ New Haven Engine Lathe.
1—Bement Car Axle Lathe.
1—24x24x7 ft. New Haven Planer.
1—30x30x8 ft. Harrington Planer.
1—36x36x18 ft. Sellers Planer.
1—36x36x20 ft. N. Y. Steam Engine Co. Planer.
4—No. 1 Brown & Sharpe Screw Machines.
2—15″ Hendey Shapers.
1—Newton Column Milling Machine.
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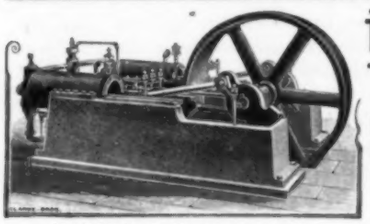

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by the end of this week all of the furnaces will be in active operation, while the rod and wire nail mills will be on full time. The Arethusa sheet mill will be started up and run steadily. The Witherow works although not being actively operated, will likely be started up by March 15. The New Castle Street Car Co.'s large plant has resumed. The tin plate works are running full and the addition is being rapidly pushed to completion. It will add greatly to the capacity of the plant.

The fact that the machine tool trade is steadily but surely improving is an indication of generally better business, as that interest is generally the slowest to feel an upward movement. The Davis & Egan Machine Tool Co., of Cincinnati, one of the largest machine tool companies in the country, states that its business has increased greatly in the last three months over the previous months, in the face of the fact that this time of the year is generally the slowest in its line. Mr. Chas. Davis, of the above company, is now in the East making arrangements with its various branches to handle the business of the coming year.

Locomotive and car building: The San Francisco & San Joaquin Valley will order five locomotives; 11 are being built for the Lake Superior & Ishpeming by the Pittsburg Locomotive Works; eight for the Adirondack & St. Lawrence by the Schenectady Locomotive Works. The Duluth, Mesabi & Northern has placed an additional order for 200 cars with the Pullman Car Co. The Calumet & Blue Island will buy 300 cars. The San Francisco & San Joaquin Valley will buy 150 platform cars. The Wheeling & Lake's 1,000-car order has gone to the Barney & Smith Car Co., of Dayton, O. For the new Lake Superior & Ishpeming, the Wells & French Co., Chicago, has an order for 400 ore cars and 20 flat cars.

Daniel Webster, for 15 years associated with the Babcock & Wilcox Co., has resigned his position with that firm. Mr. Webster for the last 12 years has been the practical head of the manufacturing and construction department of the Babcock & Wilcox Co. and has made many strong friends among the large steam users and manufacturers throughout the United States. His retirement from the Babcock & Wilcox Co. was for the purpose of accepting a position with the manufacturers of the Cahall boiler, the Aultman & Taylor Machinery Co., Mansfield, O. Although the Cahall boiler has achieved a noteworthy success, still there are many cases where lack of head room or prejudice prevents the adoption of anyting but a horizontal water tube boiler. The makers have therefore decided to engage immediately in the manu-

facture of water tube boilers of the Babcock & Wilcox type, and Mr. Webster will have entire charge of this department. The Aultman & Taylor Machinery Co. expects to be ready to begin delivering the Babcock & Wilcox type of water tube boiler by June 1. H. E. Collins & Co., of the Bank of Commerce Building, Pittsburg, general sales agents for the Cahall boiler, will act in the same capacity for the new type.

Local railway officials report a large and unusual movement of Western commodities during the past few weeks. The movement came as a surprise and the various roads have been unable to supply cars as rapidly as they were needed. The Chicago, Milwaukee & St. Paul has been several hundred cars short of the demand for several days. All available cars are being rushed to the West for the purpose of averting the unusual spectacle of a car famine in March. The road has increased its repair forces at West Milwaukee to the full number employed during the fall rush. The car department time has been increased from eight to ten hours a day and the time of the locomotive department will be increased to nine hours today.—[Milwaukee Sentinel, March 2.

The Shaft Governor.

Twenty years of hard service have shown the shaft governor to be the weak spot in the modern high-speed engine—the part that calls most urgently for adjustment and most often for repairs, and, withal, it is the vital part, the part that has developed the high-speed engine. Valves and valve connections are designed to humor its whims, flywheels are made heavy or light at its bidding, and its performance is as safe and accurate an index of the engineering status of the builder as can possibly be found.

The shaft governor is not necessarily an element of weakness, and, if in many instances it has proved to be the chief source of annoyance and expense, it is mainly because simplicity and durability were not sufficiently considered in its design. In the earlier designs less attention was given to these points. Close regulation was the quality chiefly sought after, and with a success that has won for these governors first place among the devices for regulating the speed of a steam engine.—[Cassier's Magazine.

THE *Century* for March contains an editorial entitled "The Anachronism of War," in which an earnest plea is made for arbitration as a "short cut to justice," and as a practicable and necessary measure for the prevention of war between England and America. The writer expresses the opinion that the establishment of a continuous arbitration commission by England and America would result ultimately in the acceptance of the idea by other powers. The number gives the fifth installment of Mrs. Humphry Ward's Sir George Tressadye "Stamping Out the London Slums" and "Ways and Means in Arid America" are two of the more important special articles.

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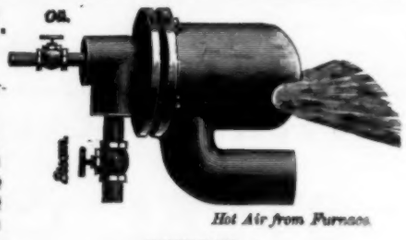

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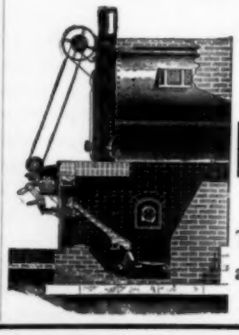

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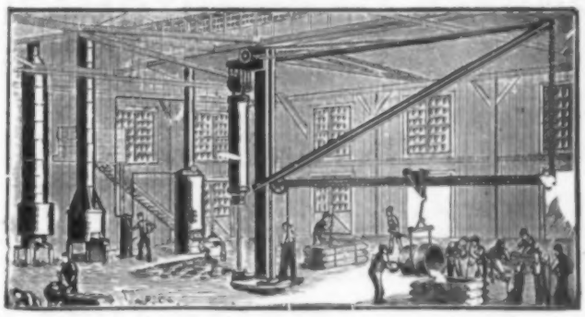

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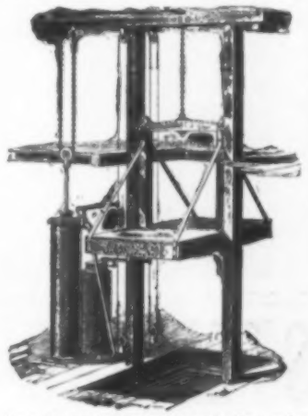

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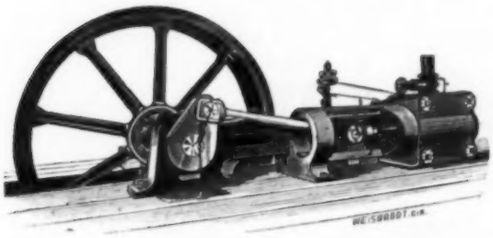

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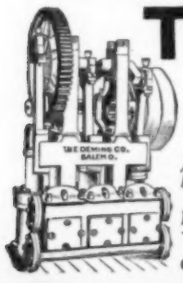

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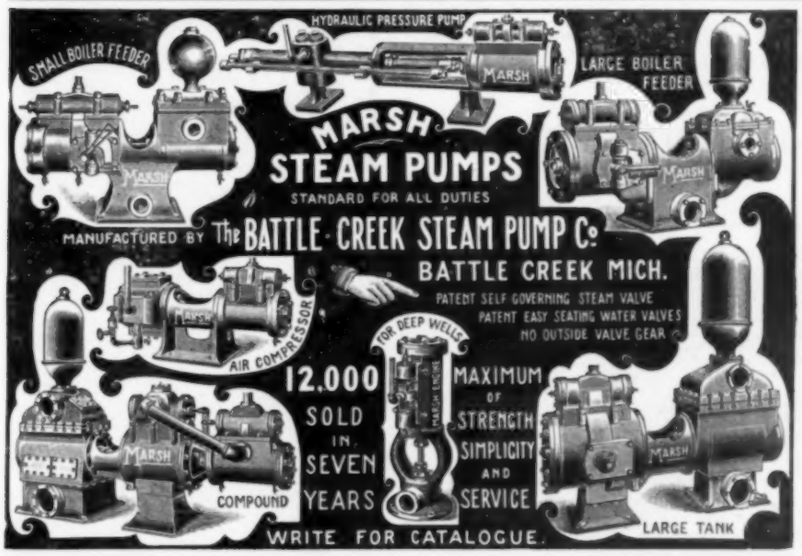

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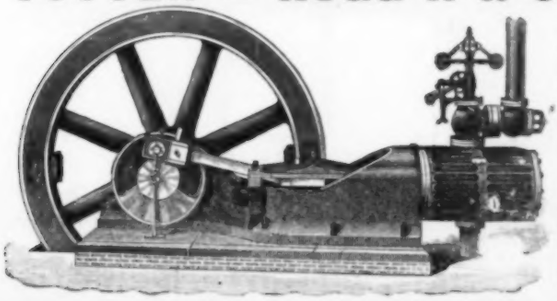

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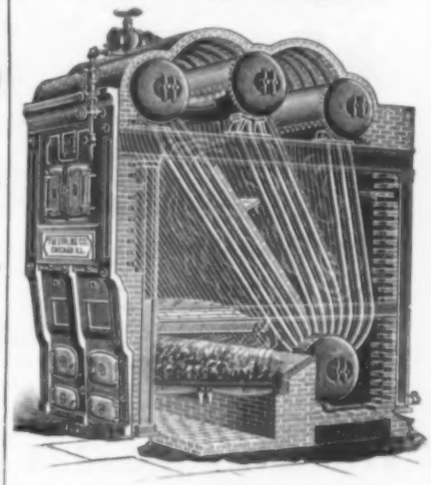

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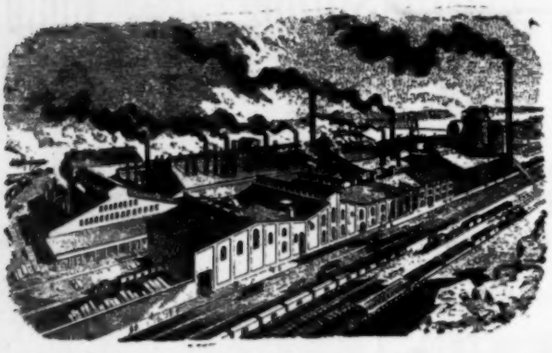

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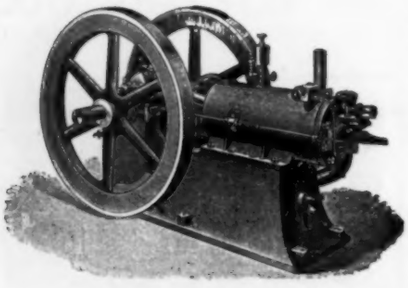

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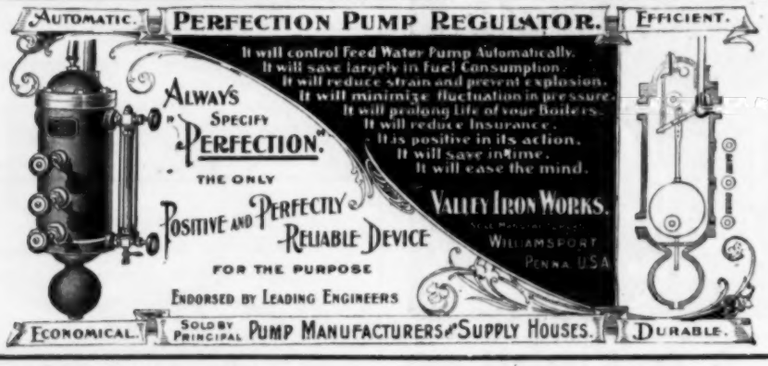
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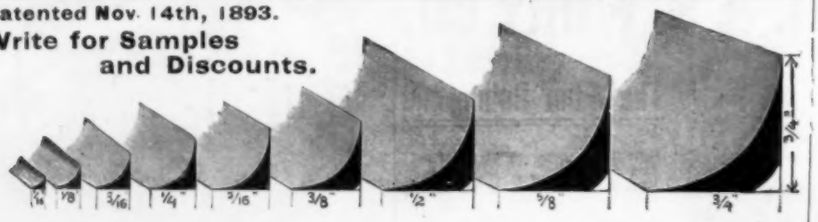

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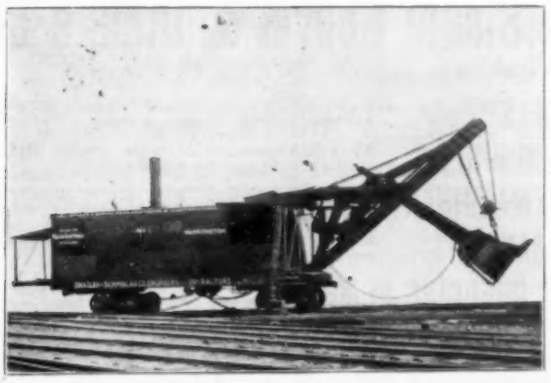

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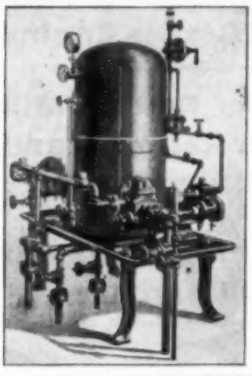

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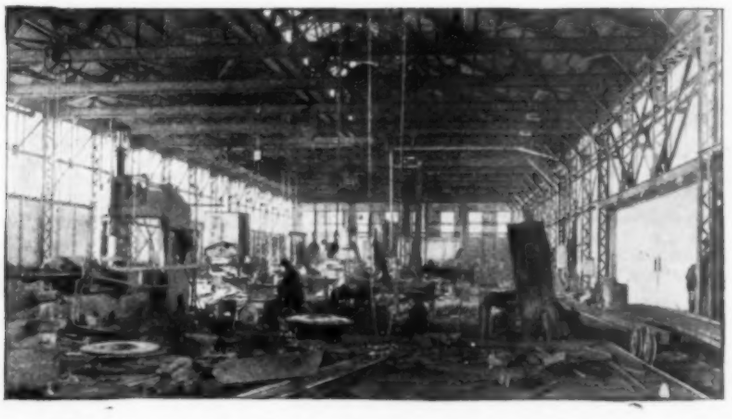

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Bringing down to Jan. 1, 1896, a description of these works. There is also a

COMPLETE DIRECTORY

to other industries which are large consumers of Iron and Steel. A new feature is a complete list of **MALLEABLE IRON WORKS.** There is also a list, brought down to 1896, of Plate and Sheet Mills and of Tin Plate Works in the United States. Making a complete Directory of

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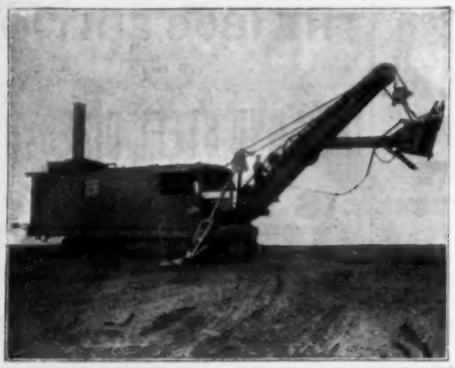

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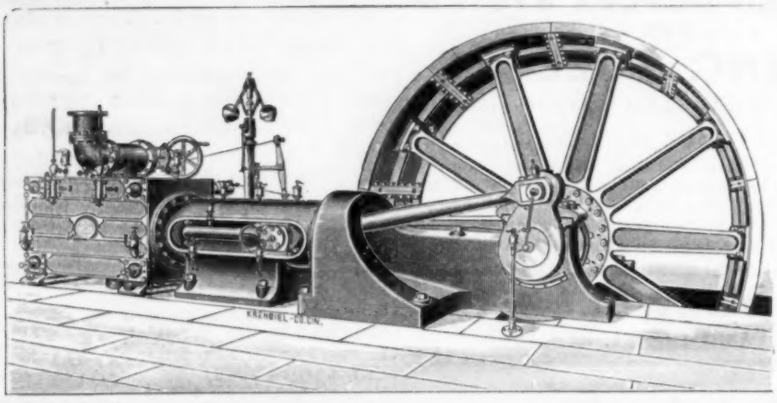

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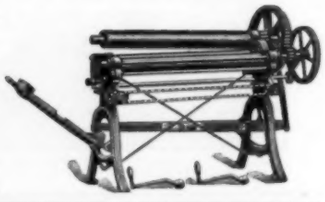

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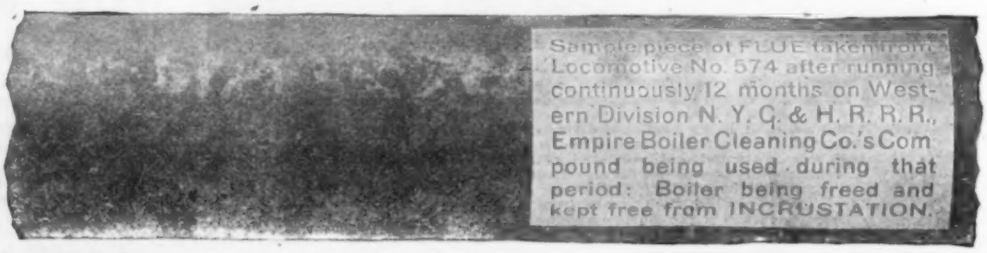
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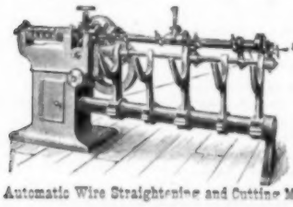

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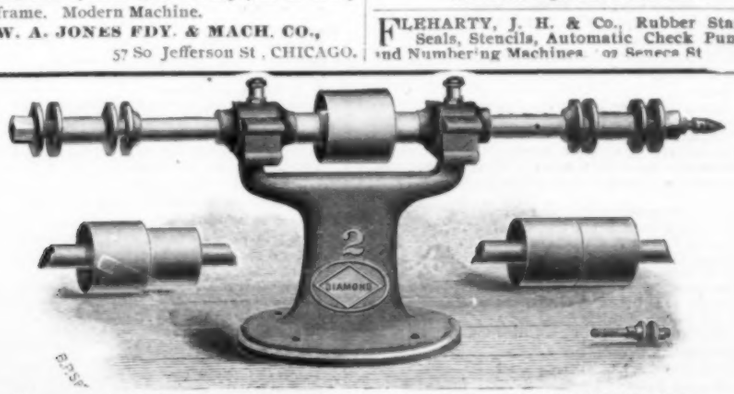

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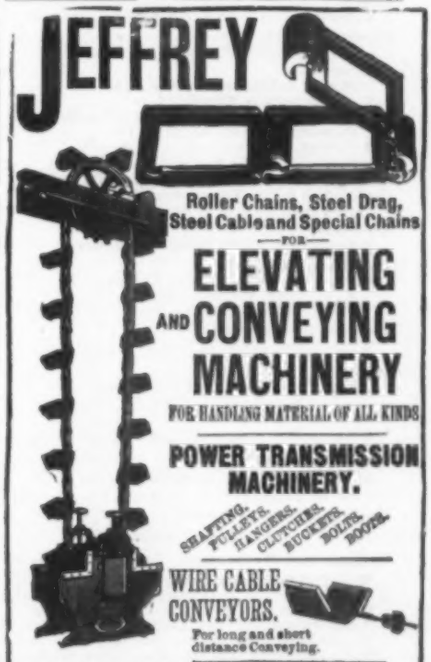

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Lodge & Shipley Machine Tool Co., Cincinnati.
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Armstrong Bros. Tool Co., Chicago, Ill.
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John Adt & Son, New Haven, Conn.
Diamond Machine Co , Providence, R. I.
Bement Miles & Co., Philadelphia, Pa.
U. Baird Machinery Co., Pittsburg, Pa.
The Wright Co., Lowell, Mass.
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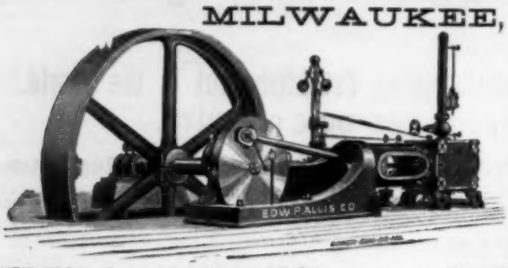

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No. 1 Strong Foundry	13 75@ 14 00
No. 2 Strong Foundry	13 00@ 13 25
No. 1 Gray Forge, red short	11 50@ 11 75
No. 2 Gray Forge, neutral	11 00
No. 1 American Scotch	14 00
No. 2 American Scotch	13 50@ 13 75
Lake Superior Charcoal	14 25@ 15 25

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No. 1 Foundry	$13 50@ 13 75
No. 2 Foundry	13 00@ 13 25
Gray Forge	11 25@ 11 50
White and Mottled	11 00@ 11 25
Warm Blast Charcoal	15 50@ 16 50
Cold Blast Charcoal	20 00@ 22 00
Bessemer	13 00@ 13 25

CHICAGO (reported by our representative:)

Lake Superior Charcoal	$13 50@$14 00
Local Coke Foundry No. 1	12 75@ 13 25
Local Coke Foundry No. 2	12 25@ 12 75
Local Coke Foundry No. 3	11 25@ 11 75
Local Scotch Foundry No. 1	12 75@ 13 25
Local Scotch Foundry No. 2	12 25@ 12 75
Local Scotch Foundry No. 3	11 25@ 11 75
Southern Coke No. 1	12 00@ 12 85
Southern Coke No. 2	11 85@ 12 10
Southern Coke No. 3	11 60@ 11 85
Southern No. 1 Soft	11 85@ 12 10
Southern No. 2 Soft	11 60@ 11 85
Southern Silveries No. 1	12 75@ 13 00
Southern Silveries No. 2	12 25@ 12 75
Jackson Co. Silveries	14 50@ 16 00
Ohio Silveries No. 1	15 00@ 15 50
Ohio Silveries No. 2	14 50@ 15 00
Ohio Strong Softeners	15 00@ 15 50
Alabama Car Wheel	16 85@ 17 35
Malleable Bessemer	13 75@ 14 00
Coke Bessemer	13 75@ 14 00

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Southern Coke No. 2 and No. 1 Soft	10 75@ 11 25
Hanging Rock Coke, No 1	12 50@ 13 50
Hanging Rock Charcoal No. 1, Fdy	16 00@ 17 00
Tennessee Charcoal No 1	13 50@ 14 00
Jackson County Silvery No 1	14 00@ 14 50
Southern Coke, Gray Forge	10 00@ 10 25
" " Mottled	9 75@ 10 00
Standard Alabama Car Wheel	15 75@ 16 25
Tennessee " "	14 50@ 15 00
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Southern Soft No. 1	12 90
Hanging Rock Charcoal	18 00

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Southern Coke No. 2	11 25
Southern Coke No. 3	11 25
Southern Gray Forge	10 75
Southern Charcoal No. 1	15 00
Missouri Charcoal No. 1	14 00@ 15 00
Ohio Softeners	16 00
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Southern Car Wheel	16 25

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	Gross Tons
Old iron rails	$17 00
Old steel rails	12 50
Old car wheels	13 00
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No. 1 R. R. wrought scrap	$12 00
Mill scrap	9 50
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Iron axles	16 00
Axle turnings	9 00
Wrought turnings (free from cast)	8 50
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Uncut wrought iron boilers	5 00
Steel boiler plates	10 00
Grate bars	6 50
Pipes and flues (clean)	8 50
Tank iron	9 00
Hoop and band iron	7 00
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Angles	1.34c@1.39c
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Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 60
4¼ to 6 by ⅜ to 1 inch	1 65
1¼ to 6 by 1⅛ to 2 inch	1 65
1¼ & 1⅜ by ⅜ to ¼ inch	1 40
1 & 1¼ by ¾ to ¼ inch	1 50
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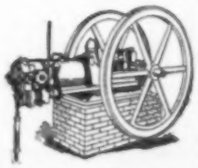
33d and Walnut Sts., PHILADELPHIA, PA.

S. M. York, 42 S. Water St., Cleveland Agent. Over 45,000 Sold.



IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND, OHIO.

ORDER DIRECT FROM THE Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

Trade Mark Registered.

Round and Square.

1 to 1⅝ inch	1 40
2 to 2⅝ inch	1 60
2¾ to 3¼ inch	1 55
3⅜ to 4 inch	1 90
4⅛ to 4⅝ inch	2 50
4¾ to 5 inch	2 70

Oval.

⅜ to 1¼ inch	1 60
⅜ to ¾ inch	1 60
½	1 80
⅝	2 00

Half Oval and Half Round.

1¼ to 3 inch	1 95
⅜ to 1⅝ inch	1 75
⅜ to ¾ inch	2 00
½	2 15
⅝	3 25

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	1 50
1 to 1⅜ by ¼ and 5-16 inch	1 55
¼ to ⅜ by ¼ and 5-16 inch	1 65
½ to ⅝ by ¼ and 5-16 inch	1 90

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	1 75
1 7-16 to 2, No. 17, 18 and 19	1 80
1 7-16 to 2, No. 20	1 90
1 7-16 to 2, No. 21	2 00
1 7-16 to 2, No. 22	2 10
1⅝ to 1⅞, No. 13, 14 and 15	1 80
1⅝ to 1⅞, No. 16, 17 and 18	1 85
1⅝ to 1⅞, No 19 and 20	1 90
1⅝ to 1⅞, No. 21	2 00
1⅝ to 1⅞, No. 22	2 10
15-16 and 1 inch, No. 13, 14 and 15	1 75
15-16 and 1 inch, No. 16, 17 and 18	1 90
15-16 and 1 inch, No. 19 and 20	2 00
15-16 and 1 inch, No. 21	2 10
15-16 and 1 inch, No. 22	2 20
⅞, No. 13, 14 and 15	2 00
⅞, No. 16, 17 and 18	2 10
⅞, No. 19 and 20	2 20
⅞, No. 21	2 30
⅞, No. 22	2 40
13-16, No. 13, 14 and 15	2 10
13-16, No. 16, 17 and 18	2 20
13-16, No. 19 and 20	2 30
13-16, No. 21	2 40
13-16, No. 22	2 50
¾, No. 13, 14 and 15	2 20
¾, No. 16, 17 and 18	2 35
¾, No. 19 and 20	2 45
¾, No. 21	2 55
¾, No. 22	2 65
11-16, No. 13, 14 and 15	2 45
11-16, No. 16, 17 and 18	2 50
11-16, No. 19 and 20	2 60
11-16, No. 21	2 70
11-16, No. 22	2 80
11-16, No. 23	2 90
⅞, No. 13, and 15	2 50
⅞, No. 16, 17 and 18	2 60
⅞, No. 19 and 20	2 70
⅞, No. 21	2 80
⅞, No. 22	2 90
⅞, No. 23	3 00
9-16, No. 13, 14 and 15	2 70
9-16, No. 16, 17 and 18	2 80
9-16, No. and 20	3 90
9-16, No. and	2 00
9-16, No. 221	3 10
9-16, No. 22	2 20
7-16 and ½ inch, No. 13, 14 and 15	3 90
7-16 and ½ inch, No. 16, 17 and 18	3 00
7-16 and ½ inch, No. 19 and 20	3 10
7-16 and ½ inch, No. 21	3 20
7-16 and ½ inch, No. 22	3 30
7-16 and ½ inch, No. 23	3 40
⅝, No. 13, 14 and 15	3 40
⅝, No. 16, 17 and 18	3 50
⅝, No. 19 and 20	3 60
⅝, No. 21	3 90
⅝, No. 22	4 00
⅝, No. 23	4 15

Light Band.

1⅛ to 6 by ⅛ to 3-16 inch	1 60
1¼ to 6 by Nos. 11 and 12	1 65
1 to 1⅜ by ⅛ to 3-16 inch	1 65
1 to 1⅜ by Nos. 11 and 12	1 70
⅜ and 13-16 by ⅛ to 3-16 inch	1 80
⅜ and 13-16 by Nos. 11 and 12	1 75
⅜ and 11-16 by ⅛ to 3-16 inch	1 90
⅜ and 11-16 by Nos. 11 and 12	1 95
⅜ and 9-16 by ⅛ to 3-16 inch	2 05
⅜ and 9-16 by Nos. 11 and 12	2 10
½ by ⅛ to 3-16 inch	2 20
½ by Nos. 11 and 12	2 25

Wagon Box Iron.

⅛ inch, beveled edge, by Nos. 11 and 12	1 80
⅛ inch, " " " " 13 and 14	1 90
⅛ inch, " " " " 11 and 12	1 95
¼ inch, " " " " 13 and 14	1 35

Sheet Iron.

No. 10	1 60
No. 12	1 70
No. 14	1 80
No. 15-17	1 90
No. 18	2 05
No. 20	2 20
No. 22-24	2 30
No. 25-26	2 40
No. 27	2 50

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 45
Shell	1 60
Flange	1 70
Marine Flange	2 00
Fire Box	2 50

Above includes plates 90 inches wide.

90 to 96 in. wide	⅛c. lb. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1⅛c. "
104 to 106 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs.
1 to 2 in, inclusive	08
9-16 to ⅞ in. "	08

ÆTNA-STANDARD IRON AND STEEL COMPANY,

BRIDGEPORT, OHIO,

MANUFACTURERS OF

TIN AND TERNE PLATE, Iron and Steel Plates and Sheets, Plain Black, Painted, Corrugated and other forms of **ROOFING, SIDING** and **CEILING.** Patent Leveled Galvanized Sheets, **BARS,** Light Section Rails, **ANGLES,** Tees, Channels, and other Miscellaneous Bars and **SHAPES.**

WITH SUCH DIVERSITY OF PRODUCT,

SPECIAL ADVANTAGES are offered buyers of mixed lots, effecting saving in freight charges and by reason of our LARGE STOCKS, securing **PROMPT SHIPMENT.**

INQUIRIES INVITED AND CATALOGUES MAILED ON APPLICATION.

ROBERTS STEEL CHAIN BELTING CO., Pittsburg, Pa.

Elevating and Conveying Machinery

For Handling all kinds of materials.

Special Wrought and Steel Chains of every description; Coil and Cable Chains; Chain Haulages for Coal Mines; Sprocket Wheels; Complete Coal and Ashes Handling Plants; Wire Rope Haulages and Wire Rope.

W. H. COFFMAN COKE CO.

BLUEFIELD, W. VA.

GENERAL FACTORS AND SHIPPERS OF

POCAHONTAS FLAT-TOP COKE.

So low in ash that it requires no fluxing for foundry purposes. Our foundry and furnace coke was awarded the first premium at the World's Fair in 1893.

AVERAGE ANALYSIS OF COKE.

Moisture	00.196	Sulphur	00.677
Fixed Carbon	93.625	Ash	05.004
Volatile Matter	00.494		

Foundry, Furnace and all sizes of crushed coke. Guaranteed lower in Sulphur than any other commercial coke

STEEL CASTINGS

FROM 10 LBS. UPWARD.

Made from Best Open-Hearth Steel.

SEND FOR ESTIMATES.

THE JOHNSON COMPANY, Johnstown, Pa.

COMBINE SAFETY WATER TUBE BOILER
L. M. MOYES, MANUFACTURER, PHILADELPHIA, PA.

GARDEN CITY FOUNDRY CO.

INCORPORATED.

Successors to **TURNER, DICKINSON & CO.**

Armitage and Central Avenues, Station G, Chicago, Ill.

FRICTION CLUTCHES, HANGERS, PILLOW BLOCKS & PULLEYS.

Large Stocks on Hand. Shipments Promptly Made.

Subscribe for the Iron Trade Review, $3 per year.

7-16 to ⅜ and 2⅜ to 3 in.	.09
3⅜ to 4 in.	.09½
⅜ to 11-16 and 4⅛	.10
⅛ to 6 in.	.10½
⅝ to 9-32 and 6⅝ to 7 in.	.11
7 in	.13

Flats.

	cts. lbs
2 to 9-16 in. wide by 2 to ⅜ thick	.8

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 50
Open-hearth Tire	"	1 80
Open-hearth Spring	"	2 20
Sleigh Shoe	"	1 90
Toe Calk	"	2 10
Cutter Shoes, tapered and bent	"	2 20

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 30
Bridge ½, ⅝, 11-16 and ¾ inch diam.	3 00

Wrought Pipe and Boiler Tubes.

Lap weld black, base	dis. 65
Butt " " "	dis.
Lap " galv. "	dis. 57½
Butt " " "	dis. 50
Boiler tubes 2¼" and smaller	dis 62½
Boiler tubes 2½" and larger	dis. 65
Casing screw and socket joint	dis. 52½
Casing inserted joint	dis. 47½

MACHINERY SUPPLY MARKET.

Anvils.

American	℔ lb 9@10
Wright's	℔ lb 12

Bellows.

Blacksmiths' Hill's	dis 40
Blacksmiths' Bullock's	dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35
Buffalo	dis 40

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis
Horton's Universal	dis
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 20

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis
" " Gear Cutters	dis

Crowbars.

Cast Steel	℔ 3½
Iron, steel points	℔ lb 3

Drill and Drill Sockets.

Twist Drills	dis 50&10
Morse Taper and Straight Shank to 1¼"	dis 50&10
Morse Taper and Straight Shank Larger than 1¼"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 55@55&5
Cleveland " "	dis 55@55&5

SHIFFLER BRIDGE COMPANY,

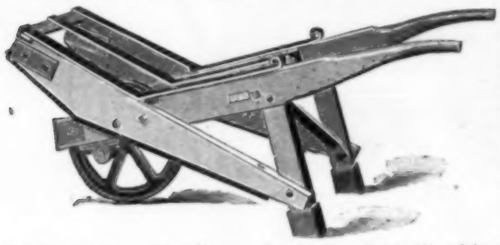
BUILDING DEPARTMENT.

SPECIALTIES: STEEL AND IRON BUILDINGS FOR ROLLING-MILLS TIN PLATE PLANTS, STEEL WORKS, FOUNDRIES, FACTORIES, ROOF TRUSSES, GIRDERS, COLUMNS, BEAMS, CORRUGATED IRON, ETC.

Main Office and Works:
48th Street and A. V. Ry.
PITTSBURG, PA.

Branch Offices:
1123 Betz Building, Philadelphia, Pa.
65 Dexter Building, Chicago, Ill.
228 Lumber Exchange, Minneapolis, Minn.

PITTSBURGH OPEN HEARTH BARROW



Weight 160 lbs. The heaviest and strongest barrow made. Ironed with half inch iron. Cast iron shoes bolted on legs. The only barrow that will stand carrying pig iron or billets. It will be noticed by referring to dimensions below that the barrow, though so heavy, is very compact, so the load is easily managed. Furnished with 40 lb. Cast Iron Wheel.

DIMENSIONS. Handle, 54 in. long. Length of iron work on top, 34 in. Telegraph name, Scurvy. For wood and steel barrows, write for prices to

Lansing Wheelbarrow Co., Lansing, Mich.

STUART FIRE BRICK CO.

MANUFACTURERS OF
Silica Brick
For Open-Hearth, Basic and Acid Steel Furnaces, Glass and Copper Tank Furnaces. Extra Shapes MADE TO ORDER.
Office, Room 21, Conestoga Bldg., Cor. Wood and Water Sts., PITTSBURG, PA.

W. J. McKINNIE Pres. W. A. MADISON, Sec'y and Treas.

THE PLAYFORD STOKER

A perfect smoke preventing furnace; perfect combustion, minimum of expense, simple in construction and economical.

A test of three tubular boilers of Cleveland Water Works, made Oct. 4th, 1895, by a waterworks engineer, shows an evaporation of over ten pounds of water to one pound of nut coal, and during the test the stack was entirely free from smoke.

The PLAYFORD STOKER CO., 919 SOCIETY FOR SAVINGS CLEVELAND, O.

Semi-Steel Castings

34,000 TO 38,000 TENSILE STRENGTH.

Process Owned by
THE McDOWELL STEEL CO.,
Room 902, Mallers Bldg., - - CHICAGO, ILL.

Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME
* Daily, † Daily, except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	†12:45 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:30 am
Philadelphia and New York	*11:10 pm	* 5:25 am
Baltimore and Washington	*11:10 pm	* 5:25 am
Alliance and Pittsburgh	*11:10 pm	* 5:25 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:10 am	* 5:45 pm
Akron and Columbus	* 8:10 am	*5:45 pm
Akron, Columbus & Zanesville	†12:45 pm	†12:10 pm
Columbus and Cincinnati	* 8:00 pm	* 7:30 am

The Cleveland Terminal & Valley R. R. Co.

Depot foot of So. Water St.
City Office 137 Superior St.

	Arrive.	Depart.
Valley Jctn. & Way Stations	*6:30 P M	*7:10 A M
Akron, Canton & Valley	*10:10 A M	*3:15 P M
Akron, Canton & Chicago	*8:10 A M	*6:30 P M
Akron, Canton & Wooster, Defiance, Garrett, Marietta, Wheeling, Washington, D. C., and Baltimore	†2:55 P M	†11:00 A M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule sleeping cars between Cleveland and Chicago.

CHICAGO HEIGHTS

The Industrial Centre of Chicago

offers **Free Factory Sites** and other inducements.

If you are seeking a new location it will pay you well to investigate the merits of our proposition.

Chicago Heights Land Association
M. H. KILGALLEN, Gen'l Mgr. CHICAGO

Emery.

	No. 4 to No. 54 46 gr.	150 gr.	Flour, C. F. F. FF.
Kegs, ℔ lb	4½c	5 c	3½c
½ kegs ℔ lb	4¾c	5¾c	3¾c
¼ kegs ℔ lb	5 c	5¾c	3 c
10 lb cans, 10 in case	6 c	6¾c	5 c
10 lb cans less than 10	10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co. ..... dis 50@50&5
H. H. Barton ..... dis 50@50&5

Emery Wheels.

Detroit ..... dis 60@70
Norton's ..... dis 60@70
Grant ..... dis 60@70
Sterling ..... dis 60@70
Celluloid ..... dis 10&33⅓
Northampton ..... dis 55
Crystal ..... dis 65@70
Vitrified ..... dis 60@70
Vulcanite ..... dis 60&10
Hamden ..... dis 60&10@70
Cyclone ..... dis 60@60&10

Files.

Arcade ..... dis 60&10@60&10&10
Nicholson ..... dis 60&10@60&10&10
" X. F ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
McClellan ..... dis 60&10@60&10&10
Disston's ..... dis 60@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50
Industry File Works Hand Cut ..... dis 50

Hammers.

P. S. W ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs 12c
" " " " over 5 lbs 10c

Jack Screws.

Illinois Bolt Co. list ..... dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	7/16	½	⅝	¾	1
Square	8	7	5½	4¼	4	3½	3¼	
Hexagon	15½	11½	8½	6	5¼	5¼		
Washers	9	8	7	5	4¼	4½	4¼	

In lots less than 100 lbs, ℔ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887 ..... dis 85
Standard Penny Nails, ℔ keg card rate
Car lots $2 25
Less than car lots $2 35

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz ..... dis 10@10&10

Picks.

Railroads, 5 to 6 lbs ..... $12 dis 60
" 6 to 7 lbs ..... $13 dis 60

Pulleys.

Iron Pulleys, Walker List ..... dis 50
Medart Pulleys ..... dis 50
Split Wood Pulleys ..... dis 55@60

Pulley Blocks.

Moore's Anti-Friction Differential Chain Pulley Block ..... dis 20

Rivets.

Iron, Thousand, list November 1, 1894 ..... dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894 ..... dis 60@65
Copper ..... dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list ..... dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2½ in ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 55
Pulley Taps ..... dis 40

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 15@20
Howard ..... dis 35

Wire.

New List, Apr. 9, 1894

Brass ..... dis 4c
Copper ..... dis 4c
Bright and annealed, Nos. 0@18 ..... dis 70&10&75
" " Nos. 19@26 ..... dis 75@75&5
" " Nos. 27@36 ..... dis 75&10&5
Coppered Nos. 0 to 18, market list ..... dis 70@70&5
Galvanized Nos. 0 to 18 " " ..... dis 65&5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... 05c ℔ lb dis 30

Wrenches.

Coe's genuine ..... dis 50
Girard Standard ..... dis 70&10
Agricultural ..... dis 75&10
Mechanic's ..... dis 55&10&5
Bemis & Call's Combination ..... dis 35
Donohue's Engineers ..... dis 20&10
Lamson & Sessions Engineers ..... dis 60
Billings & Spencer's Drop Forged ..... dis 25
William's " " " ..... dis 25
Alligator " " " ..... dis 40

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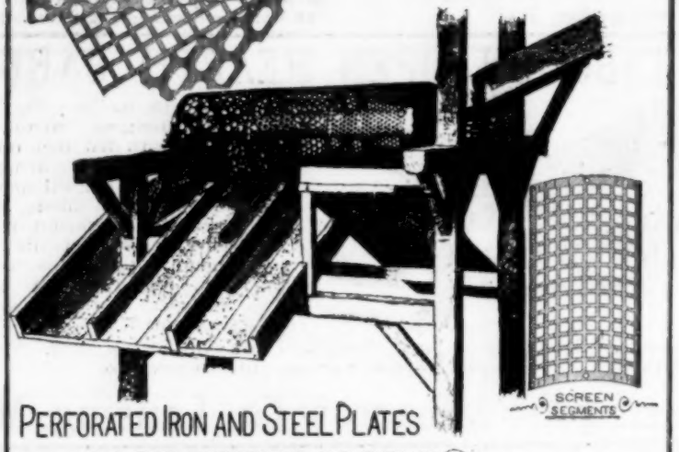
Chicago Heights Land Association

M. H. KILGALLEN, Gen'l Mgr. CHICAGO

THE HARRINGTON AND KING PERFORATING CO.

CHICAGO, ILL.



PERFORATED IRON AND STEEL PLATES

FOR SCREENING AND SIZING

COAL, COKE, ORE, STONE &C.

BRONZE PLATES TO WITHSTAND THE ACTION OF MINE WATERS.

PLATES FURNISHED FLAT, OR ROLLED TO CYLINDRICAL FORM FOR REVOLVING SCREENS.

PERFORATIONS IN ROUND, SQUARE, OR OBLONG HOLES.

WE DO NOT FURNISH SCREENS COMPLETE ONLY PERFORATED SCREEN PLATES.

ECLIPSE MUSIC PLATES
ELECTROTYPE
ENGRAVING CO.
58 FRANKFORT ST. CLEVELAND
TELEPHONE 1916

ARE YOU LOOKING

FOR A CHANGE IN LOCATION?

If you are not satisfied with your present site, or if you are not doing quite as well as you would like to, why not consider the advantages of a location on the Illinois Central R. R. or the Yazoo & Mississippi Valley R. R.? These roads run through South Dakota, Minnesota, Iowa, Wisconsin, Illinois, Indiana, Kentucky, Tennessee Mississippi and Lousiana, and possess

FINE SITES FOR NEW MILLS,
BEST OF FREIGHT FACILITIES,
CLOSE PROXIMITY TO
COAL FIELDS AND DISTRIBUTING CENTERS
AND
INTELLIGENT HELP OF ALL KINDS,
MANY KINDS OF RAW MATERIAL.

For full information, write the undersigned for a copy of the pamphlet entitled

100 Cities and Towns WANTING INDUSTRIES

This will give you the population, city and county debt, death rate, assessed valuation of property, tax rate, annual shipments, raw materials, industries desired, etc.

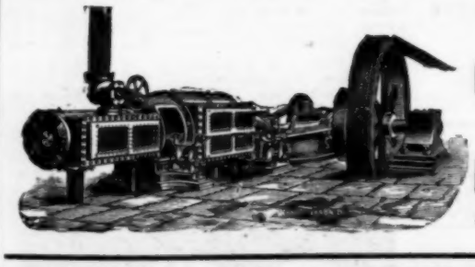
To sound industries, which will bear investigation, substantial inducements will be given by many of the places on the lines of the Illinois Central R. R., which is the only road under one management running through from the North-Western States to the Gulf of Mexico. GEO. C. POWER, Industrial Commissioner I. C. R. R. Co., 506 Central Station, Chicago. 1-2-'94

WILLIAM TOD & CO.

YOUNGSTOWN, OHIO.

THE PORTER-HAMILTON ENGINE

SINGLE, COMPOUND & CONDENSING

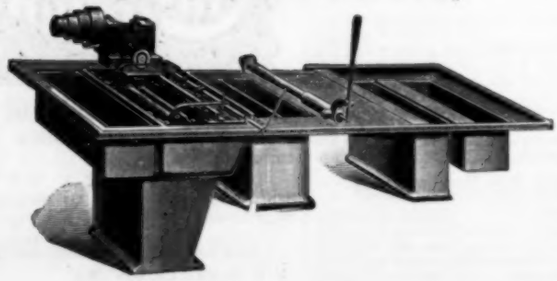


Blowing Engines.
Hydraulic Cranes and Accumulators.
Heavy Special Machinery.

Albert Fisher, Western Agent, 1025 Monadnock Blk., CHICAGO.

THE LLOYD-BOOTH CO., YOUNGSTOWN, OHIO.

Tinning MACHINERY



Rolling Mills, Sand and Chill ROLLS.

P. & B. Ruberoid Roofing is peculiarly adapted for Buildings of any character which are exposed to Acids, Alkalies, Coal Gas, etc. Thoroughly effective strong, and very durable.

We Invite Correspondence on the Subject.

THE STANDARD PAINT CO.,

SOLE MANUFACTURERS.

3 Liberty Street, . . NEW YORK.

Chicago Office, 186 5th Avenue.
Cleveland, Ohio, - The A. T. Osborn Co.

PYROMETERS

Edward Brown,

ESTABLISHED 1860.

311 WALNUT St., PHILADELPHIA.

Manufacturer and Patentee

OF THE

Hot Blast (or Graphite) Pyrometer.—The only stationary Pyrometer now in use durable over 700 degrees.

The Standard Portable Pyrometer—For Blast Furnaces.

Mercury Revolution Indicator.—Centennial Exhibition Medal. Accurate for all time.

Annealing Oven Pyrometer—to 3,000 degrees—of 1894.

Tin-plating Pyrometer—of 1894.

Mercury and Steam Gauges.

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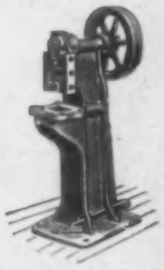

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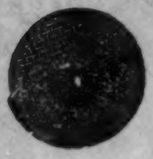

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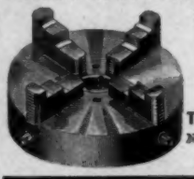

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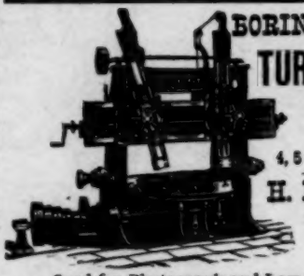

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